

## An unusual case of generalised subcutaneous emphysema in emergency room of tertiary care hospital: A fatal outcome

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**ABSTRACT**

Subcutaneous emphysema (SE) is collection of air under the subcutaneous layer or below the dermis. Traumatic SE is caused when a patient sustains a blunt or a penetrating injury and is usually confined to the site of injury, but rarely becomes extensive enough causing pneumomediastinum which can lead to airway obstruction. It can also cause pneumopericardium leading to obstructive cardiomyopathy which can result in death of the patient. Other complications include pneumoperitoneum, *pneumoscrotum*. The treatment of choice for SE is thoracostomy tube placement. Following case describes a 25 years old male patient who presented with pelvic diastasis and SE due to fall from tractor. The patient was managed conservatively in a local hospital after which he was referred here for further management.

**Keywords:** Subcutaneous emphysema, pneumomediastinum, pneumoperitoneum, *pneumoscrotum*, thoracostomy.

**1. INTRODUCTION**

The formation or penetration of air below the subcutaneous layer of skin is known as SE. As this subcutaneous layer is beneath the dermis, spread of air can easily involve deeper tissues. Restricted subcutaneous spread is not a concern for clinical downturn. Nonetheless, the advancement of SE can suggest that the air is occupying deeper areas within the body which are not visible. This extravasation of air in other body cavities can be responsible for causation of pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum and pneumothorax (Kukuruza and Aboeed, 2022a).

The spread of air to head, neck, chest and abdomen can be backed by the movement of air along the pressure gradients between intra-alveolar and perivascular intersitium through connected fascial and anatomical planes (Maunder et al., 1984). Another reason for spread can be attributed to coughing, vomiting and forceful straining (Soares et al., 2015). SE should be distinguished from other severe pathological entities (such as gas gangrene or necrotizing fasciitis) as these lesions have rapid progression along with high morbidity and mortality (Saela et al., 2022). The management starts by

ascertaining the cause of subcutaneous infiltration of air. Placement of subcutaneous incisions, needles, drains, or cervical mediastinotomy are some approaches for the same (Aghajanzadeh et al., 2015). The following case report, describes traumatic SE due to injury to pelvis in a road traffic accident causing the death of the patient due to septic shock.

## 2. CASE REPORT

A 25-years-old male patient presented to the emergency medicine department, with chief complaints of pain and swelling at pelvic region, groin and scrotum for 5 days. Patient gave alleged history of fall from tractor while going back to home and sustained injury to pelvis, abdomen and scrotum. He was taken to a local hospital immediately, where he was managed conservatively for 5 days.

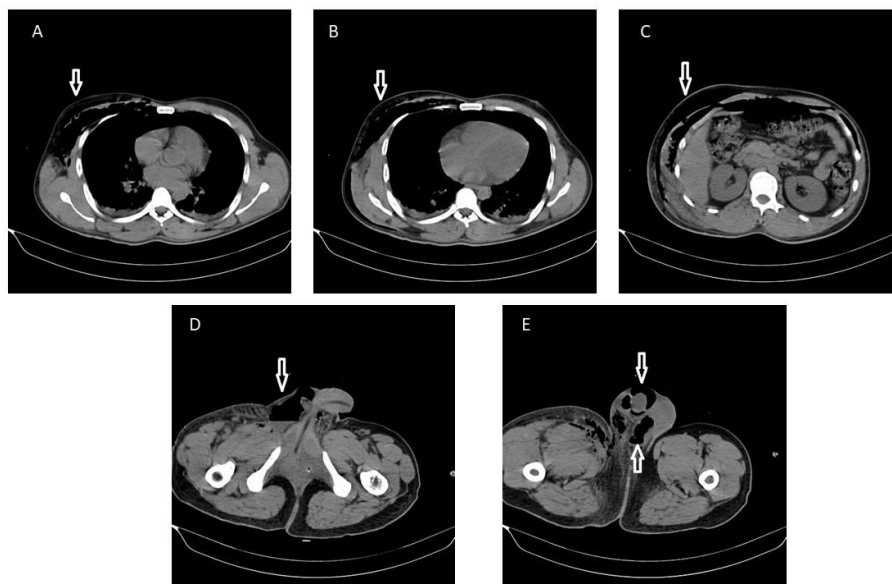
The patient was brought to emergency medicine department in the evening hours. Primary survey: 1) Airway- patent; 2) Breathing- R. R=16/min, SpO<sub>2</sub>=98%; 3) Circulation- Pulse=102/min, B. P=90/60 mmHg; 4) Disability- GCS= E<sub>3</sub> V<sub>4</sub> M<sub>5</sub>; 5) Exposure- none. Secondary survey: Cardiovascular system- S<sub>1</sub>, S<sub>2</sub> normal, no murmur; Respiratory system- bilateral air entry present and equal; Per-abdomen- tenderness present at hypochondriac and epigastric region, guarding present; Central nervous system- conscious, oriented.

On Local examination, Scrotal examination- diffuse swelling over anterior scrotal region involving right inguinal region, Transillumination was absent; Pelvic examination with both hips- diffuse swelling present over pubic area, pelvic compression present, tenderness at pubic symphysis and mid-shaft femur, hip rotation painful and grossly restricted, history of indigenous treatment present.

Patient was advised pelvic binder application, X-ray chest, X-ray abdomen, CECT abdomen and pelvis, USG bilateral inguinoscrotal region with mid right thigh. Patient was advised admission under orthopaedics ward. Patient was shifted to surgery ICU from orthopaedics ward in view of extensive traumatic SE which appeared on CECT abdomen and pelvis, extending from xiphisternum to mid-thigh on the right side within 12 hours of admission.

### Investigations

Patient's routine investigations were done: Hb%-11.7 gm%, Platelets-1.5 lakhs/cu.mm, PT-INR-1.49, Creat-1.6 mg/dl and total bilirubin-2.4 mg/dl. USG abdomen and pelvis was -s/o diffuse echogenicity superficially across abdominal wall s/o traumatic SE. Later USG inguinoscrotal region was - S/O bilateral thickened scrotal wall. USG thorax was S/O bilateral pleural effusion with subsegmental atelectasis. CT-scan abdomen plain was S/O traumatic subcutaneous and intermuscular emphysema with pneumoperitoneum, pneumomediastinum and pneumoscrotum. Pubic diastasis with displacement of sacroiliac joint and fractures as described above, Bilateral pleural effusion with subsegmental atelectasis, Hepatomegaly.



**Figure 1** (A, B, C) shows SE on the right side along with pneumomediastinum and pneumoperitoneum. (D, E) shows pneumoscrotum.

### 3. TREATMENT

Treatment given in emergency medicine department: Inj. Tranexamic acid 1gm in 100ml NS, IVF 1l RL, Inj. Diclofenac 1ml in 100ml NS IV twice daily, Inj. Pantoprazole 40mg IV stat f/b 40mg IV once daily, Inj. Ondansetron 4mg IV stat f/b 4mg IV thrice daily, Inj. Nor-adrenaline infusion @ 3ml/hour adjusted according to BP, Inj. acetylcysteine 600mg in 100ml NS IV thrice daily, Inj. Vitamin K, pelvic binder application, foleys catheterization.

Treatment in SICU: Inj. Meropenem 1g IV thrice daily, Inj. Linezolid 600mg IV twice daily, Inj. Metronidazole 100ml IV thrice daily, Inj. Pantoprazole 40mg IV once daily, Inj. Ondansetron 4mg IV thrice daily, Inj. Furosemide 10mg IV thrice daily, Inj. Hydrocortisone 50mg IV four times daily, Inj. Paracetamol 100ml/1gm IV, Inj. Multivitamin + 1-unit Normal saline once daily, Inj. Butorphanol tartrate 1mg IV thrice daily, Inj. Lower Molecular Heparin 0.4ml SC twice daily, Tab. Calcium 500mg twice daily, Vitamin D<sub>3</sub> sachet 60,000 IU once a week, Lactobacillus sachet TDS.

Patient's condition started to deteriorate for which patient was intubated and was kept on ventilatory support. Patient was managed on iv fluids and iv antibiotics with inotropic support. Patient developed pneumonia and was not responding favourably to the treatment given. Also, patient's CBC counts were deranged, Hb%- 9 gm%, platelet count- 0.27 lakhs/cumm for which 7 RDP and 1 PRC was transfused. Antibiotic cover was continued for severe sepsis. Despite of all the efforts the sepsis kept on increasing. Infraclavicular gill incisions were given for SE, which were found to be not so effective and hence tracheostomy was done for the same, after which SE started to resolve.

Patient was diagnosed with severe traumatic sepsis with coagulopathy, AKI with high grade pyrexia, sacral diastasis with open book fracture, traumatic SE (resolving). Patient went into cardiac arrest and resuscitation was done according to ACLS protocol, but patient was not resuscitated and declared dead.

### 4. DISCUSSION

SE was first described by Louise Bourgeois, French queen's midwife in 1617 and later by Laennec in 1819 and since then it has been a frequently observed phenomenon typically after any injury, surgery, mechanical ventilation and infection. Nonetheless, there have been cases showing up with new onset SE for which no causative events could be found. Primary significance of SE can be attributed as a marker for occult pneumothorax and chest injuries associated with it. Extensive SE can be suggestive of underlying tracheobronchial injury (Olmstead et al., 2018). Typically benign, SE causes only aesthetic concerns and occasionally vision issues. It will require prompt intervention as it progresses beyond tactile fascination in order to ease the patient's anxiety and limit potential complications like hypoxia, cardiac tamponade, sudden death (Dixit and George, 2012), which in turn are complications of pneumomediastinum, pneumoperitoneum and pneumoretroperitoneum.

SE should be diagnosed early and treated accordingly as early as possible as it can be a fatal complication of blunt injury such as in this case. In the diagnostic approach of SE, a plain chest x-ray film can be diagnostic. However, in many cases a CT is also performed if a diagnostic dilemma exists (Grapatsas et al., 2018). On plain x-ray, a ginkgo leaf sign may be seen, which appears when subcutaneous air outlines the pectoralis major muscle, resembling a ginkgo leaf. Apart from X-rays, CT-scan shows dark areas in the subcutaneous layer which indicates presence of gas. In addition to that, CT-scan is sensitive enough to determine the cause of SE that may not be visible on X-ray (Kukuruza and Aboeed, 2022b). As in this case, a CT scan was also done to rule out pneumothorax and to obtain information on the cause of SE. SE can be diagnosed clinically also; it can be done by placing the stethoscope's diaphragm over the patient's skin where SE is suspected to be. Thus, we are able to hear sound of small bubbles bursting (Medeiros, 2018). This method is rarely used as more advanced diagnostic methods are available, but this method can be used in emergency situations where the facility with advanced diagnostic methods is far away.

Most of the times physicians tend to miss out on SE due to other distracting injuries, it only emerges after scans are done. SE once diagnosed should be treated as early as possible. All the serious causes of SE should be excluded beforehand. Several management techniques have been described to control SE. Although, SE resolves spontaneously on its own in most of the cases but, traditional management techniques along with high-quality supportive care can be helpful in ensuring patient's safety. A tube thoracostomy should be done in all cases of SE where the patient is supposed to be transported over long distances through ground ambulance or air ambulance in order to prevent any disastrous respiratory complications (Aghajanzadeh et al., 2015). Other methods to treat SE include; pleural drains, infraclavicular "gill" incisions, subcutaneous negative-pressure drain. The method used depends upon the origin, position and severity of the emphysema. Most trauma centres prefer to use thoracostomy tube placement as the treatment of choice. A non-significant SE can be resolved by inhalation of high-concentration of oxygen, this helps in reabsorbing the air more quickly from the subcutaneous layers (Aghajanzadeh et al., 2015). As we know SE is self-resolving and self-limiting, hence it usually resolves in a time span of 2-3 days for small SE, and 5-10 days for a significant SE. Surgical

intervention is required in some case with extensive SE, but in most cases conservative management is the key along with supportive care.

In our case the patient presented with extensive SE for which treatment of choice was placement of thoracostomy tube, and infraclavicular gill incisions were also placed and SE was resolving, but patient's condition still kept deteriorating with progressive irreversible septic shock.

## 5. CONCLUSION

Pneumomediastinum and spontaneous SE are typically treatable conservatively, without surgery. However, it is advised to conduct the diagnostic procedures to rule out significant pathologies. Primary health centres should be equipped with necessary diagnostic tools for the diagnosis to be made as early as possible and necessary actions can be taken. This will save both patient's life and reduce the time taken in reaching the diagnosis.

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### Author Contributions

Ibrahim Bombaywala and Akhilesh Singh contributed in selection of case and drafting the manuscript, Charuta Gadkari guided us in perfecting the manuscript.

### Informed consent

Written and oral informed consent was obtained from the patient included in the study.

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### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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