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Case Report

A case of spontaneous pneumomediastinum, pneumothorax with subcutaneous emphysema in a preschool child

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ABSTRACT

Spontaneous subcutaneous emphysema is the presence of gas or air beneath the skin and soft tissues. Pneumothorax and pneumomediastinum are identified by the existence of free gas or air in the associated spaces. 4-year-old with progressive body swelling of 12-hour duration, started just after nebulisation with bronchodilators prescribed for his cough and cold. Examination revealed conscious, anxious, irritable child and obvious superficial swelling of face, scalp, neck, chest and both upper limbs. tachycardia, tachypnoea and his oxygen saturation were 82% at the time of admission. There was crepitus on palpation. Investigations were done; A diagnosis of spontaneous pneumomediastinum, left pneumothorax with spontaneous subcutaneous emphysema was made. Managed with emergency implantable cardioverter-defibrillator (ICD) insertion, oxygen, intravenous antibiotics, intravenous fluids, analgesics, and nebulisation.

Keywords: Spontaneous subcutaneous emphysema, Pneumomediastinum, Pneumothorax, Hamman syndrome

INTRODUCTION

Spontaneous subcutaneous emphysema is the presence of gas or air beneath the skin and soft tissues. Pneumothorax and pneumomediastinum are identified by the existence of free gas or air in the associated spaces. The swelling caused by emphysema can involve any body part notably the chest, neck, scalp, trunk, and the upper limbs. Co-existence of subcutaneous emphysema pneumothorax and pneumomediastinum is more common in patients with acute exacerbations of bronchial asthma. In addition, pneumothorax rarely complicates pneumonia in immunocompetent children.[1]

Spontaneous pneumomediastinum is an uncommon disorder with an incidence of 0.0025% among emergency room visits, in whom it primarily appears as a complication of thoracic injury, surgical operation or pulmonary infection.[2] The first case series of spontaneous pneumomediastinum was published by Louis Hamman in 1939 and therefore the condition is called Hamman's syndrome. The pathophysiological process was experimentally demonstrated by Macklin and Macklin in 1944.[3] Occasional cases are reported to result from forced Valsalva's manoeuvre due to cough, emesis, a first attack of wheeze or asthma exacerbations.[4]

In this report we describe a rare occurrence of extensive subcutaneous emphysema associated with pneumothorax and pneumomediastinum in a 4-year-old child.

CASE REPORT

This is a case of a 4-year-old boy who was brought by his parents on account of progressive body swelling of 12-hour duration. The swelling was said to be rapid in onset, started from the left chest region and rapidly progressed to involve the face, right side of chest and upper limbs. The swelling started just after nebulisation with bronchodilators prescribed for his cough and cold.

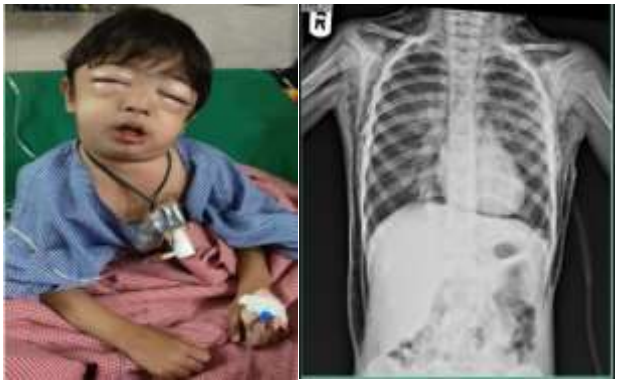

Figure 1: On admission clinical photograph and CXR showing massive subcutaneous emphysema.

There was no history of chest trauma or airway instrumentation, no personal or family history of asthma or foreign body aspiration. He was exclusively breastfed and fully immunised as per age. His growth and development milestones had been satisfactory, and he weigh 12 kg at presentation.

Examination revealed conscious, anxious, irritable child and obvious superficial swelling of face, scalp, neck, chest and both upper limbs. He had tachycardia, tachypnoea and his oxygen saturation was 82% at the time of admission. There was crepitus on palpation of the swelling but no signs of inflammation. He was not febrile and was well hydrated.

Investigations were done. A diagnosis of spontaneous pneumomediastinum, left pneumothorax with spontaneous subcutaneous emphysema was made.

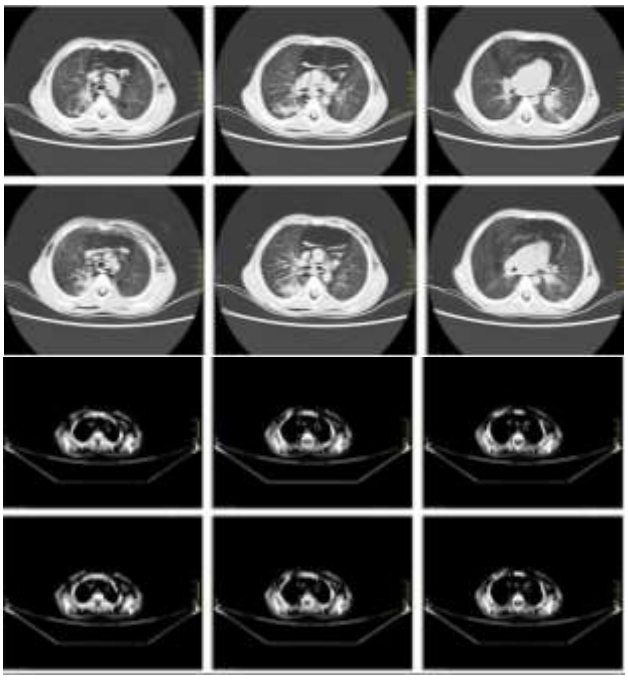

Figure 2: CT chest showing air in mediastinum and subcutaneous plane.

He was managed with emergency ICD insertion in the 4th left ICS midaxillary line with 14F ICD connected to under water seal. Air bubbles were noted. Oxygen was given by mask at 2 l/min, intravenous meropenem and cefuroxime were started and continued for 5 days, intravenous fluids were also given as child was unable to take orally. Nebulisation continued with salbutamol. Ibuprofen and paracetamol were given for analgesia.

Subcutaneous emphysema increased immediately after ICD insertion. Stabilised within 48 hours and started declining after 72 hours.

Results of CBC RFT SE were all WNL. Blood c/s yielded no growth. X-rays showed streaky areas of lucency under the skin of neck chest abdomen and upper limbs. Patchy consolidation with air bronchograms present.

Patient improved, ICD removed and discharged after 5 days. The child was seen twice on follow-up and has been healthy.

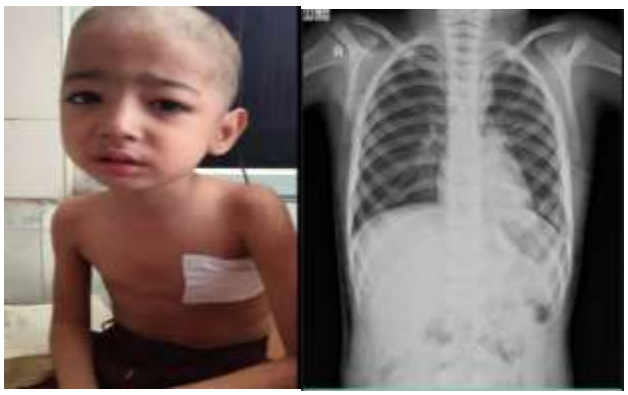

Figure 3: Clinical photograph and CXR on follow-up visit.

DISCUSSION

Subcutaneous emphysema results from processes allowing free air to enter the subcutaneous tissue. It is commonly caused by pneumomediastinum or pneumothorax.[5] The primary diagnosis of our case was pneumonia, which was complicated by subcutaneous emphysema pneumomediastinum and pneumothorax, as there was response to antibiotics, although the child had a normal blood counts and blood culture was negative.

Subcutaneous emphysema is thought to arise in spontaneous pneumothorax through the 'Macklin effect'. The rupture of alveoli in a spontaneous pneumothorax is followed by an air leak into the loose connective tissue surrounding the pulmonary vasculature. This air tracks centripetally along the broncho-vascular sheath to the mediastinum. From here, aberrant air is free to follow a continuum of fascial planes that connect the mediastinum and soft tissues. This has been demonstrated in animal studies and can be observed on CT imaging.[6]

The clinical symptoms of pneumothorax and/or subcutaneous emphysema critically depend on the amount of extravasated gas and the extension of the affected areas. Most frequently, they include chest pain, dyspnoea, dysphonia, and dysphagia.[7,8] Massive accumulation of air in the subcutaneous tissue, when associated with tension pneumothorax, may also compromise the life of the patient, causing acute respiratory distress syndrome.[9] Whereas subcutaneous emphysema causes swelling and crepitus over the involved anatomical site, pneumomediastinum characteristically gives a positive Hamman's sign (crunching or clicking noise heard synchronously with the heartbeat on auscultation, in left lateral decubitus position) when it is clinically significant.[10] It is not only found in Hamman's syndrome and spontaneous pneumomediastinum but also in patients with pneumothorax.

SE can be diagnosed clinically by the detection of oedema and crepitus of the scalp, eyelid, neck, thorax, abdomen, and other body regions. Radiograph imaging, along with chest roentgenogram and CT, can confirm the presence of soft-tissue air entry.[11,12]

Pneumomediastinum can be detected radiologically on chest X-ray. CT is considered the gold standard for detecting mediastinal air, as it can detect small amounts that cannot be seen on chest X-ray.

Subcutaneous emphysema, pneumothorax, and pneumomediastinum secondary to cough or Valsalva manoeuvre are considered benign conditions and amenable to conservative management.[13] One proposed option for SE is placing blow holes, circular incisions with partial skin removal to evacuate soft-tissue emphysema.[12,14,15] The source communication between the pleural cavity and surrounding soft tissue is nearly never addressed. Another management proposal in the literature suggests using bilateral infraclavicular incisions, which are modified blow holes of linear shape to provide better lung expansion and effective air evacuation. Furthermore, this method is thought to provide a rapid and cosmetically appealing outcome compared with more invasive alternatives such as cervical mediastinotomy.[16]

Indications of observation as an initial management for pneumothorax remain controversial. Management depends on the clinical setting, aetiology, and size of the pneumothorax, and whether it is open or closed, and simple or tension pneumothorax.[17] Thoracic catheter drainage is recommended for a first large (rim of air in the thorax >2 cm according to the British Thoracic Society 2010 criteria) or symptomatic episode of primary spontaneous pneumothorax.

Treatment for pneumomediastinum is generally conservative due to typically benign presentation; however, the extent of treatment is dependent on presentation severity. A rare complication from pneumomediastinum is when a large of air is entrapped in the mediastinum, also known as malignant Pneumomediastinum, which can cause blockage of the trachea and major vessels present in the mediastinum would require decompression with thoracotomy.[18]

CONCLUSION

Our management largely focused on the left pneumothorax evacuation. The patient's subcutaneous emphysema continued to improve throughout her hospital stay, and he did not require blow holes or infraclavicular incisions.

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