

Sub-Cutaneous Emphysema and Pneumo-Mediastinum in the Perioperative Period

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ABSTRACT

Sub-cutaneous emphysema and pneumo-mediastinum may occur as a rare complication during or immediately after surgery. It can be caused by tracheal intubation related airway or esophageal ruptures. A case of sub-cutaneous emphysema and pneumomediastinum during the perioperative period is reported. The patient was observed with sub-cutaneous emphysema of face and chest wall within a few minutes after surgery. HRCT revealed sub-cutaneous emphysema and pneumo-mediastinum.

Key words: sub-cutaneous emphysema, pneumo-mediastinum, endotracheal intubation, Perioperative period.

Key Message:

Surgical emphysema and pneumomediastinum are a very rare complication of endotracheal intubations and peri-operative retching. The diagnosis is confirmed by CT scan after strong clinical suspicion. The present report highlights the importance of a high index of clinical suspicion and timely utilization of CT scan while routine investigations miss the diagnosis.

Introduction

Sub-cutaneous emphysema occurs when air gets into tissues under the skin. Air in the mediastinal tissue is referred to as Pneumo-mediastinum or mediastinal emphysema. They may occur spontaneously or after trauma (iatrogenic/non-iatrogenic). Sub-cutaneous emphysema and pneumomediastinum resulting from anesthetic procedures or from vomiting are very rarely reported.

Case Report

A 10 year old child underwent an uneventful right herniorrhaphy repair (Bassinis) for indirect inguinal hernia. Her past medical history was not significant.

General anesthesia was induced. The patient was intubated using Mc Intosh laryngoscope with 2" number blade and a 5.5" endotracheal tube on first attempt without difficulty or evident trauma. Induction was done with inj. thiopental sodium 150mg dil. in 10cc with atropine 0.6mg i.v. Anesthesia was maintained using succinylcholine 50mg i.v. vecuronium 3 mg stat. followed by 0.6mg twice in ½ hour intervals. At the end of surgery, the neuromuscular blockade was reversed, the patient was awakened, and extubated. Ondansetran injection 4 mg i.v was administered for nausea.

Ten minutes after arriving in the post-operative ward, the patient experienced an episode of nausea, retching and vomited a small amount (about 15-20ml) of clotted blood with gastric contents within 10 minutes of this event. Duty doctors noticed swelling over the left half of her face and the periorbital area. Complete examination revealed swelling and crepitus involving the left half of her face, the entire anterior part of her neck, and the entire left half of her chest extending down to the upper abdomen. On the right side of the chest the emphysema extended up to her nipples only. No dyspnoea, oxygen desaturation or hemodynamic instability was noted at that time. On auscultation, surgical crepitus was felt and heard and normal breath sounds were heard throughout the chest. Hamman's sign was negative. E.C.G. was normal. A portable radiography showed pneumo-mediastinum and bilateral sub-cutaneous emphysema of the neck and chest wall. There was no evidence of pneumothorax.

She was kept under continuous observation in RICU to watch for sudden airway compromise and related complications. Patient was administered high flow oxygen; further observation did not show any airway compromise. A baseline HRCT was done which showed sub-cutaneous emphysema with pneumo-mediastinum. (Figures 1 and 2 - next page),

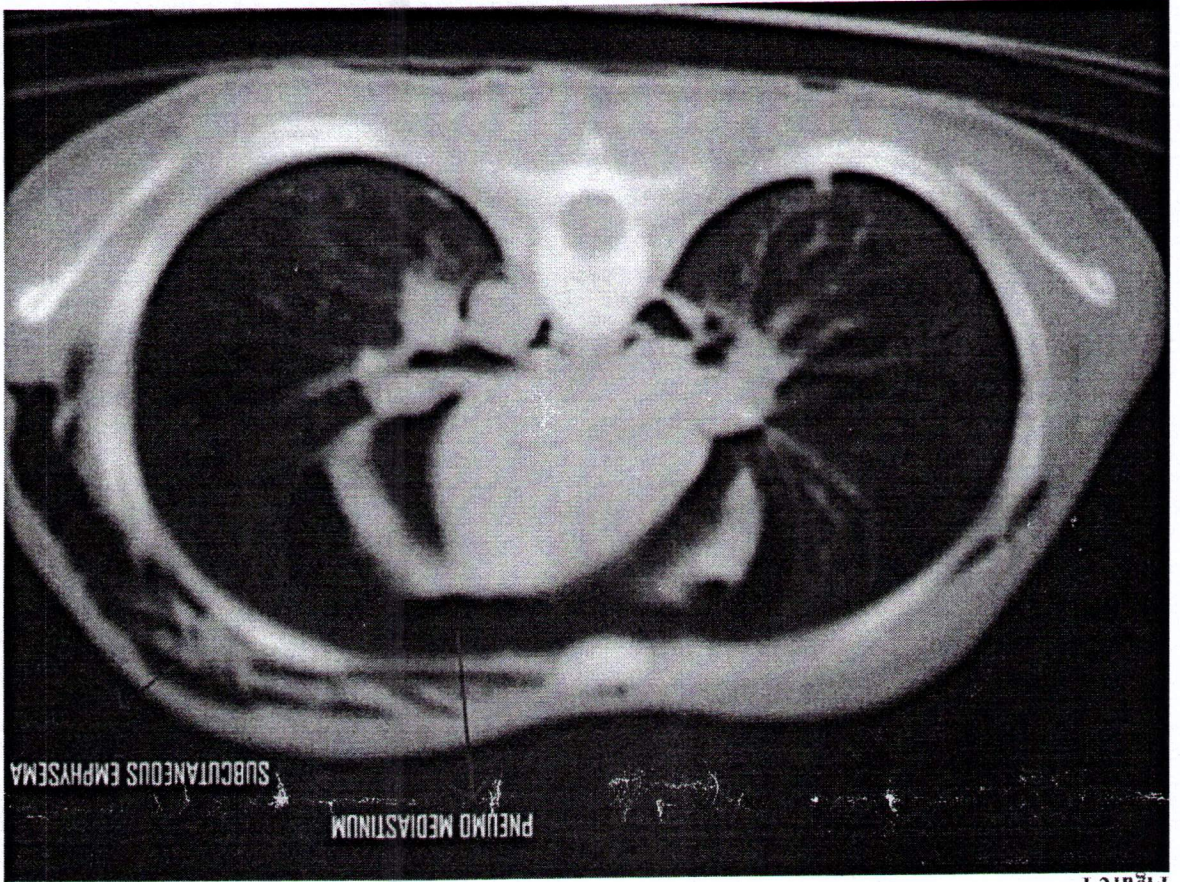


Figure 2

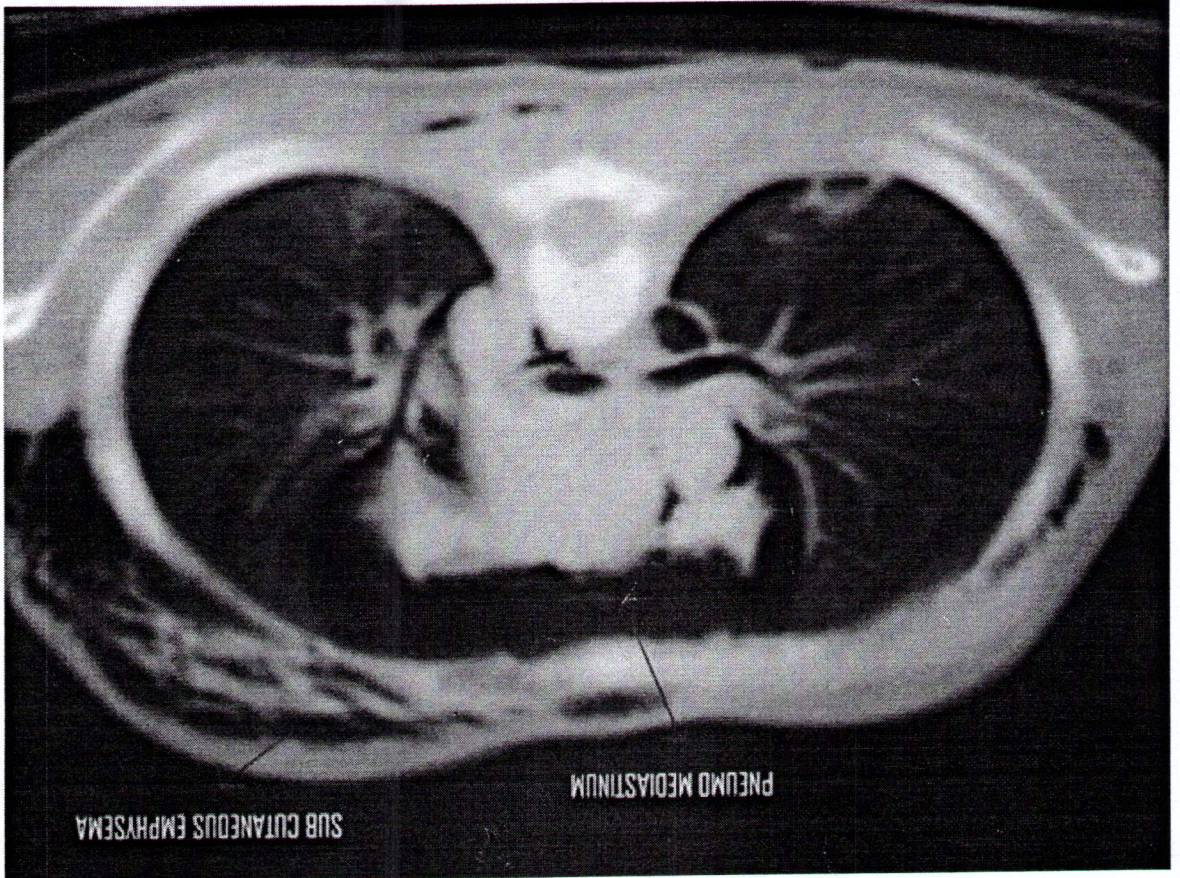


Figure 1

An opinion from the cardiologist, pulmonologist and ENT specialist opinion were sought. A fiberoptic bronchoscopy was planned but was refused by patient's family members.

Patient was observed in the RICU for 4 days, there was gradual resolution of the sub-cutaneous emphysema. Patient recovered without any complications.

Discussion

This report describes rapidly progressive sub-cutaneous emphysema and pneumomediastinum during the perioperative period. Differential diagnosis includes alveolar rupture, hypo pharyngeal perforation, tracheobronchial lacerations and Boerhaave syndrome.(1, 3) In order to establish the correct diagnosis, imaging studies and bronchoscopy must be performed promptly.(3)

Increased alveolar pressure produced by Valsalva maneuver (vomiting) may cause alveolar rupture and result in sub-cutaneous emphysema and pneumomediastinum. These cases are notable for their lack of sequelae and their spontaneous resolution.(1)

Trauma to pharynx, esophagus or trachea from laryngoscopy, intubation, and cuff inflation is one potential explanation. In our patient there was no indication that any of these procedures were difficult or caused trauma, although there is a possibility of occult injury.

Bronchoscopy is helpful in visualizing the tear in some patients, but our patient was in a state of apprehension and had refused any further invasive procedures.

Mechanical factors such as vigorous attempt of intubation, inexperienced anesthesiologist, over-inflation, rapid inflation, rupture of cuff, patient movement with bronchial cuff inflated, inadequate tube size, use of stylet and vigorous coughing contribute to tracheal rupture.

Possible anatomical factors such as congenital tracheal abnormalities, chronic obstructive pulmonary disease, and inflammatory lesion of the tracheobronchial tree, steroid therapy, lymph nodes or neoplasm causing distortion of the trachea can predispose to tracheal rupture.

Almost all cases of post intubation tracheal lacerations are reported in short females. Our patient also was short (height 133 cm). The diagnosis is suspected at extubation or 2-6 hours later. The laceration usually occurs longitudinally in the posterior membranous wall of the trachea or at the junction of the membranous wall and the cartilaginous ring. Most injuries occur in the lower one third of the trachea. Mucosal erosion or perforation of the anterior cartilaginous tracheal wall by the tip of the tube or the stylet is very rare. (2, 3, 4)

Boerhaave syndrome presents with a classical triad of vomiting, followed by severe chest pain and rigidity of upper abdomen. All of these symptoms are not present in many cases. Early diagnosis and aggressive surgical treatment can reduce mortality and morbidity. Yet, there are several

reports of successful conservative management, when leakage is minimal or has aborted. Usually the lower esophagus is involved, with a vertical split. The irritant infective fluids and gaseous contents may be released into left pleural space. The diagnosis is confirmed by conventional contrast study or CECT. Progression to circulatory failure and death from septic shock, Pneumonitis and mediastinitis can occur.(5)

Small esophageal tears present with insidious onset and can be managed conservatively.

Patients with pneumo-mediastinum develop substernal chest pain often pleuritic, dyspnoea, dysphonia, dysphagia, odynophagia, high pitched nasal tone, either separately or in combination. Hamman's sign can be demonstrated on auscultation. E.C.G changes are low voltage, non-specific axis deviation, ST-wave changes. Chest radiography usually demonstrates a thin radiolucent strip along the mediastinal facial plane, most commonly along the left heart border. The aortic knob may be highlighted as well. CT scan chest is more sensitive for the diagnosis of pneumo-mediastinum.(6)

Conservative management may be appropriate for uncomplicated longitudinal lacerations that are < 3 - 4 cm in size, and involve less than one third of tracheal circumference. The goal is to establish airway patency for uneventful healing of injury and prevent complications.

Management includes broad-spectrum antibiotic prophylaxis, cough suppressants, extubation if feasible, mechanical ventilation to maintain low pressures, avoidance of frequent endotracheal suction, bronchoscopy for pulmonary toilet. In all published cases of conservative management, healing was uneventful, without any residual airway stenosis.

Prompt surgical repair is indicated in cases with clinical deterioration, mediastinitis or increased mediastinal fluid collection and uncontrolled air leaks. Tracheal laceration involving the cartilaginous wall always requires a surgical repair. The surgical approach is determined by the site of the injury; right thoracotomy incision for the lower third, and cervical incision for the upper two thirds of the trachea. Acute complications include tension pneumothorax, anoxia and arrhythmias. Sub-acute complications include lethal mediastinitis, pneumonitis and tracheal strictures.

In conclusion, sub-cutaneous emphysema and pneumo-mediastinum can have variegated causes like endotracheal intubation related airway ruptures or Boerhaave syndrome. A high index of suspicion is required as prompt diagnosis and early management can be life saving.

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