

Management of Extensive Subcutaneous Emphysema in Intensive Care Unit

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Abstract

Case Report

Subcutaneous emphysema (SE) refers to trapped air beneath the dermis. It can affect any body site and may spread from one area to another by travelling along fascial planes under the effect of pressure gradient. In some cases, air effusion in different body cavities can secondary occur leading to pneumomediastinum or pneumothorax. SE is not dangerous in it and may regress spontaneously. However, extensive SE complications such as respiratory failure and cardiovascular collapse may engage the vital prognosis requiring urgent care. In this article, we present a case of a 30-year-old male with extensive subcutaneous emphysema associated to a pneumomediastinum, secondary to a deep perianal wound. We report this case for its rarity.

Keywords: Pelvic trauma, perianal wound, extensive subcutaneous emphysema, pneumomediastinum, decompression.

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INTRODUCTION

Subcutaneous emphysema (SE) may be defined as the entrapment of gas within the subcutaneous layer [1]. The incidence of SE goes from 0, 43% to 2, 34% [2]. An observatory study covering 10 years showed that the majority of patients with SE were male [2].

Usually, the SE is benign and requires nothing more than rest and monitoring. However, in some cases air may spread over fascial plans leading to extensive SE with severe complications necessitating an urgent management.

CASE REPORT

A 30-year-old patient, without pathological history, presented to the emergency department of the University Hospital Center Hassan II of Fez for severe pelvic trauma caused by a heavy object (marble stone).

On examination, the patient was awake and conscious, vitally stable; pulse rate of 110 beats per minute, and oxygen saturation was maintained at 97% on room air, with a functional limitation to the lower limbs. The perineal exam was difficult and revealed a perianal wound with a superficial lesion of 3 cm in the scrotal area.

CT of the chest/abdomen/pelvis was performed in emergency and showed a complex and unstable pelvic fracture with pneumoscrotum and abdominal subcutaneous emphysema.

The patient was taken to the operating room, under general anesthesia; pelvic fractures were stabilized with external fixation. The suture of the scrotal injury and a dressing of the perianal wound were performed. Postoperatively, the patient was admitted to the intensive care unit for monitoring of vital signs, analgesia, and prophylactic antibiotics.

During his hospitalization, the patient remained conscious; hemodynamically and respiratory stable, with a biological assessment without abnormalities. However, over the next three days, the subcutaneous emphysema worsened, became very marked, involving the face, neck, chest, armpits, abdomen and thigh. The patient did not have any dyspnea, neck pain, dysphagia or dysphonia. On physical examination, diffuse subcutaneous crepitations were palpable, respiratory rate was normal with oxygen saturation of 98% on room air. The patient was afebrile; he had been placed on 15 L/min of O₂.

Thoraco-abdominopelvic CT scan (TAP-CT) was performed which showed the presence of extensive

subcutaneous emphysema, extending from the left thigh up to face, with distinct pneumomediastinum. Air was dissecting cervical, chest and abdominal walls, scrotal content, anal margin and left thigh. There was no pneumothorax (Figure 1-2).

The scan did not identify a parietal defect in the tracheobronchial tree, the presence of pneumoperitoneum or abnormalities of the digestive walls.

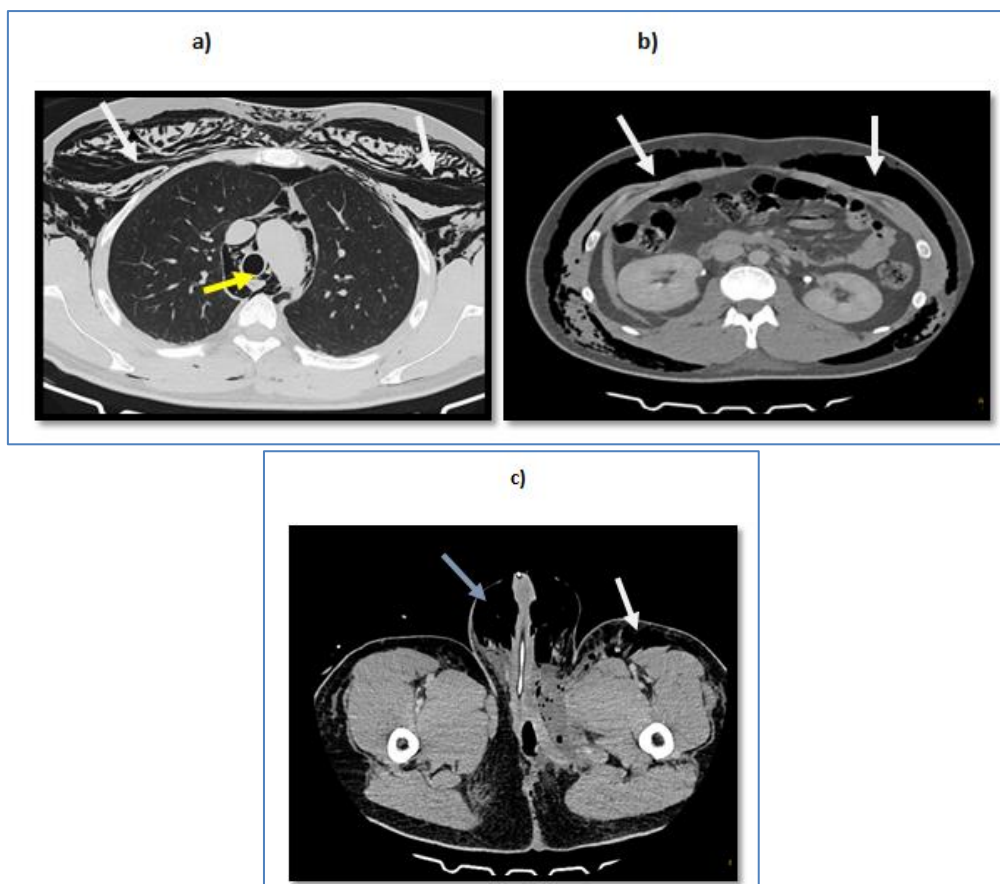


Fig-1: Axial sections CT chest (a)/ abdomen (b)/ pelvis (c) showing extensive subcutaneous emphysema (white arrows) with distinct pneumomediastinum (yellow arrow) and Pneumosrotum (blue arrows).



Fig-2: Coronal plane computed tomography (CT) of the chest, abdomen and of the pelvis showing extensive subcutaneous emphysema

The patient was readmitted to the operating room where exploration of the anal region revealed the presence of a deep left perianal wound communicating with scrotum and soft-tissue infection (Figure 3). The wall of the anal canal and rectum was intact.

At the end of clinical and radiological examinations, the diagnosis of extensive SE secondary to a perianal wound was retained.

Blowhole incisions were made in the scrotum, inguinal folds, and thigh and in the right and left iliac fossa with placement of blades of Delbet (Figure 4).

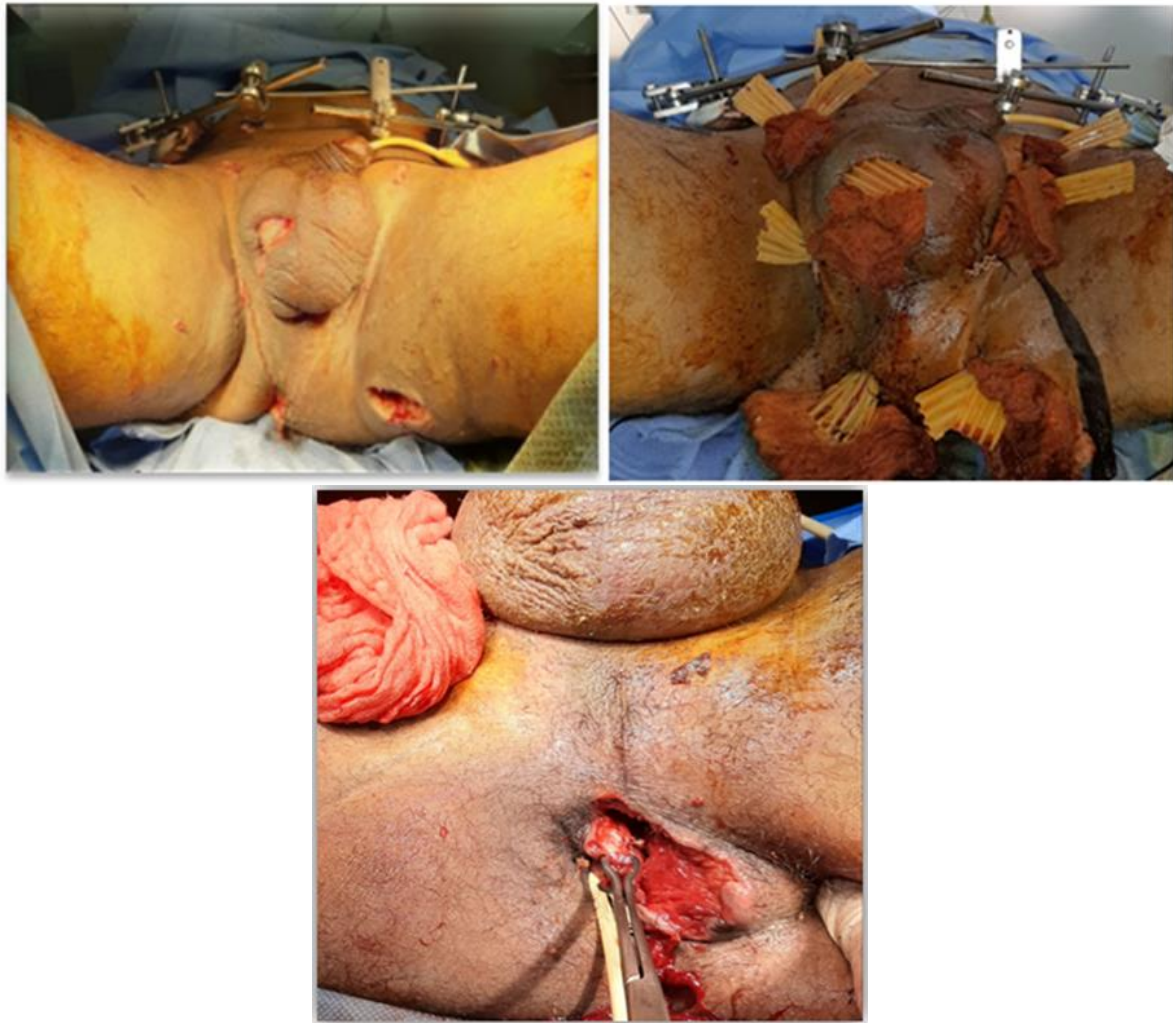


Fig-3: Deep left perianal wound communicating with scrotum (the probe is introduced into the anus).



Fig-4: Multiple incisions in the scrotum, inguinal folds, thigh, right and left iliac fossa with placement of blades of Delbet

The patient received analgesic and probabilistic antibiotic therapy based on ertapenem and metronidazole, the subcutaneous emphysema gradually improved although did not resolve completely (Figure 5). The patient received regular clinical and biological monitoring with daily dressing change.

He was discharged 10 days after the operation in stable condition. He will be followed up by the visceral surgery department.

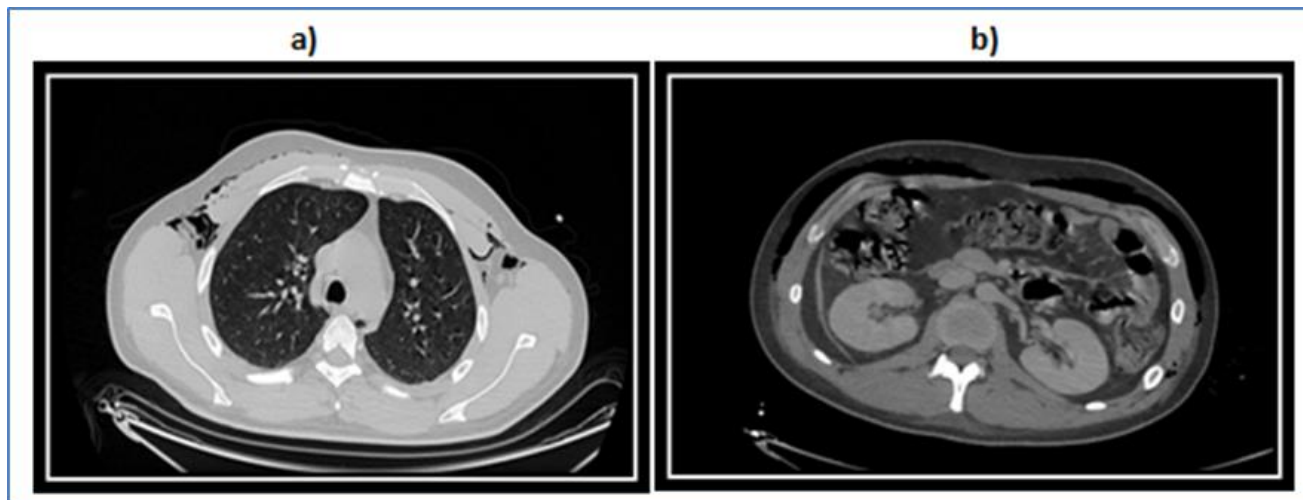


Fig-5: Axial sections control CT chest (a)/ abdomen (b) on day 8 showed a clear improvement of subcutaneous emphysema.

DISCUSSION

Subcutaneous emphysema (SE) was described in the literature for the first time in the late 1910s by Berkeley and Coffen [3]. It is defined clinically by the presence of gas in the soft tissue. The main site of SE is the upper chest region and neck; however, it can touch anybody area according to the causal etiology [2, 4]. Otherwise, the air can spread from one location to another through the facial planes connections. SE may be associated with a pneumomediastinum and so was the case for our patient.

Understanding pathogenesis of the movement of air between areas calls for global comprehension of body anatomy. Indeed, the cervical visceral space, which is limited anteriorly by pretracheal fascia, is connected to the mediastinum and the retroperitoneum by following the trachea and esophagus, creating a virtual airway between those different compartments. Besides, the posterolateral portion of the retroperitoneum has anatomic communication with anterior abdominal wall. Moreover, the endothoracic fascia (as the outermost membrane of the thoracic cavity) is linked to abdominal transversalis fascia [5].

The connection we described previously explains why the air arising in one region may be received in any other area directly by spreading over fascial planes leading to "general emphysema".

The Palpation of the characteristic crackling snow is the key for positive diagnosis of SE [5, 6]. Physical finding can be confirmed by radiology. In case of thoracic subcutaneous emphysema, careful inspection of the chest roentgenogram shows gas density inside subcutaneous tissues, on this X-ray examination, we can also make the diagnosis of pneumomediastinum by objectifying linear or curvilinear lucencies outlining mediastinal contours and the continuous diaphragm sign reported by Levin [7]. In our case, and considering the extent of SE, we directly proceeded to the realization of thoraco-abdominopelvic CT scan for both positive and etiological diagnosis. In CT scans, air pockets appear as dark areas [8], like the extensive ones we found in our patient images.

Since 2013, SE is divided into five grades depending on their severity (figure 6) [2]. Our patient is included in the fifth grade.

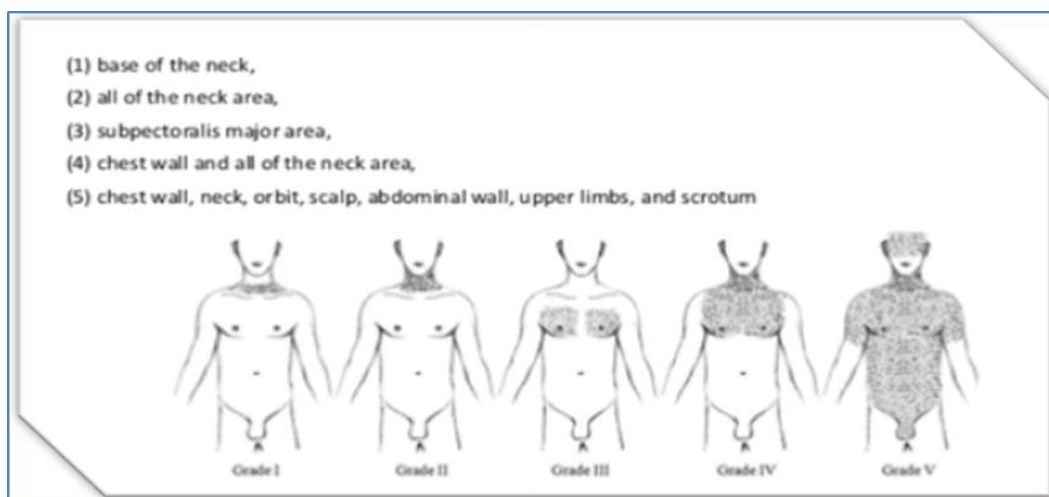


Fig-6: Classification of SE

The diagnosis of subcutaneous emphysema requires etiological research: blunt and penetrating trauma, infections such as gangrene; foreign body ingestion; local procedures (endoscopy, tracheostomy or tracheal intubation) [2, 9]. The term spontaneous SE is used when no etiology is found. In our case, the SE was secondary to a deep perianal wound communicating with the scrotum in the context of pelvic trauma. Very few similar cases have been described in the literature which makes our observation original.

Subcutaneous emphysema constitutes a therapeutic emergency due to its complications such as secondary infection of emphysema like within our patient, areolar or scrotal skin necrosis, pneumomediastinum, tracheal compression and respiratory failure [2, 10, 11]. To avoid compressive complications we performed decompression through subcutaneous incisions.

While benign SE may spontaneously regress and requires only bed rest, analgesic treatment and oxygen therapy [12]. The literature review reveals other management options for the severe cases, like drain insertion in the compromise subcutaneous space [13]. Use of needles has been also reported [14]. Otherwise, controlling the main cause of SE remains necessary: surgical sutures of ruptured trachea or esophagus, treatment of pneumothorax, antibiotics and surgical management of skin infections that can lead to gangrene [4].

CONCLUSION

SE is a relatively frequent entity seen in the intensive care unit, its diagnosis should always require etiological research, although, it can sometimes be spontaneous.

Even if SE is usually benign, health care professionals must stay vigilant in order to avoid its complications.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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