

# Subcutaneous Emphysema as a Life-Threatening Complication of Metastatic Renal Cancer: A Case Report

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**ABSTRACT:** Subcutaneous emphysema (SE) could present as an emergency situation requiring appropriate management because of possible serious complications. While the diagnosis can be well established, its classification and treatment are not yet standardized. Herein we report the case of SE occurred in a young man after positioning of a thorax drainage because of a hydro-pneumothorax developed as a consequence of pulmonary metastases from clear cell renal carcinoma. Since there are no data correlating anatomic-clinical categorization with outcome and treatment of patients with SE, a "tailored- treatment" may be considered.

**KEYWORDS:** Hydro-pneumothorax, metastatic clear cell renal cancer, subcutaneous drains, subcutaneous emphysema, frail patient.

## Introduction

Subcutaneous emphysema (SE) is a medical condition defined by the presence of air in soft tissues.

Infection, chest traumas and spontaneous pneumomediastinum are the three main causes of SE [1].

This typically benign condition may become life-threatening when air accumulates thereby causing compression of upper airways and/or main blood vessels.

Signs and symptoms indicative of SE include neck swelling, crepitation on palpation and dysphonia [2].

A rapid clinical examination associated to a chest X-ray is usually enough to establish the diagnosis of SE.

The treatment options are essentially based on subcutaneous drainage, infraclavicular incision or suction-on in situ chest drain [3].

Nonetheless, rapid diagnosis and an appropriate treatment are crucial to prevent possible life-threatening complications.

The patient herein illustrated highlights a case of a young man with a history of pulmonary metastases from a clear cell renal cancer presenting with SE of the neck related to hydro-pneumothorax.

## Case Report

A 47-year-old man was admitted to the Oncologic Department of St. Anna Hospital during the follow-up of a metastatic clear cell renal cancer.

The patient reported severe dyspnoea associated to oxygen saturation of 80% at rest.

Apart from a markedly reduced vesicular murmur, physical examination did not disclose major abnormalities.

A CT scan of the chest showed a wide right hydro-pneumothorax.

Because of this finding, a thoracic drainage was inserted resulting in an initial improvement of the symptoms.

After the procedure, blood pressure was 120/80mmHg, heart rate was 85 beats per minute and oxygen saturation was 94%.

During the night the patient complained of a progressive shortness of breath with agitation and cyanosis.

The vital parameters rapidly deteriorated with a blood pressure of 95/80mmHg, oxygen saturation of 74% (in ambient air), a respiratory rate of 26 breaths per minute and a heart rate of 102 beats per minute.

A chest X-ray was showed an extensive pneumothorax associated with SE.

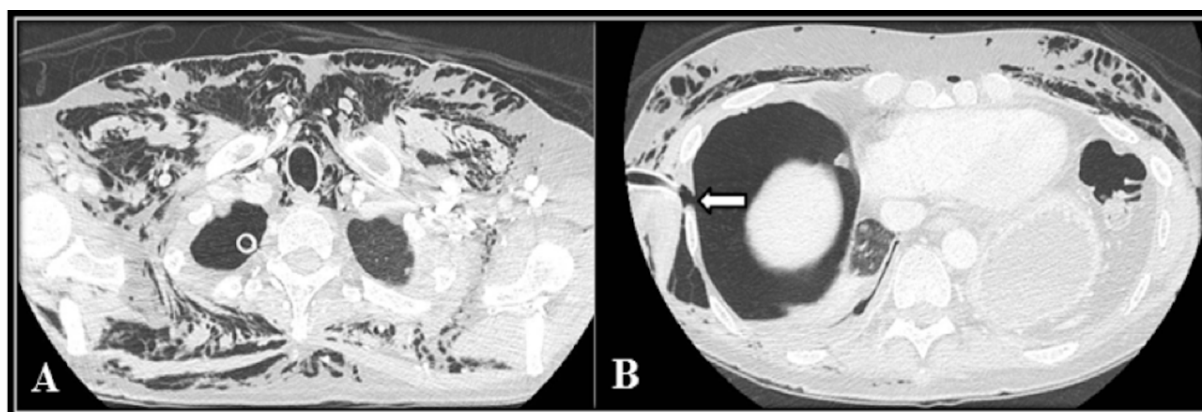
An emergency CT scan confirmed the presence of a pneumothorax along with pneumomediastinum and diffuse SE mainly involving the neck-head, thorax and scrotal region (i.e., grade 5 according to the Aghajanzadeh *et al.* classification) [4]. (Panel A)

The origin of the air diffusely localized throughout the soft tissues was attributable to a communication between the pleural cavity and the subcutaneous tissue with evidence of an anchorage defect in the drainage system (Panel B, arrow).

Because of the critical situation, it was decided that two subcutaneous drainages were placed in the region of the pectoral muscles along with a compressive massage and high-flow oxygen therapy.

As a result, patient's vital signs improved dramatically with blood pressure of 110/70 mmHg, heart rate 90 beats per minute and oxygen saturation of 94% with low-flow oxygen treatment.

Despite the efforts the patient died of pneumonia one month later. A written informed consent was obtained from the relatives before publishing these data.



**Figure 1. Chest CT scan showing SE of the upper thorax (A). The point of anchorage defect of thorax drainage causing a communication between the pleural cavity and soft tissue is indicated by the white arrow in image B.**

**Table 1. Anatomical classification of subcutaneous emphysema (SE) in five grades and stratification of involved patient in one of these classes (grade 5).**

Grade	Description following Aghajanzadeh et al. classification	Involved patient's grade
1	SE to base of neck	
2	SE to the whole neck area	
3	SE to subpectoralis major area	
4	SE to chest wall and all of neck area	
5	SE to chest wall, neck, orbit, scalp, abdominal wall, upper limbs and scrotum	X

## Discussion

SE is defined by air accumulating throughout subcutaneous soft tissues.

There are three main causes of SE: infection (such as mediastinitis or retropharyngeal abscess); traumas (mucosal damage, e.g. direct penetrating trauma or dental surgery); and idiopathic (spontaneous pneumomediastinum) [1].

SE is often a benign, self-limiting condition; nevertheless, some cases with prominent neck involvement may determine life-threatening complications such as compression of airways and main blood vessels.

Chest pain, dysphonia and neck swelling are the main features of patients with SE.

A subset of patients may also complain of dyspnoea, pain localized in the neck region and sore throat [2].

Physical examination reveals the typical findings of SE, i.e. a swollen appearance and crunchiness of the skin on palpation.

Rarely Hamman's sign can be identified, that is crunches synchronized with heart beat in the precordial area [4].

The diagnosis is based on a rapid clinical examination along with a chest X-ray showing air in the soft tissues.

A former study including 405 trauma patients<sup>5</sup> highlighted that SE could be an indirect sign of an underlying pneumothorax, unrecognized by standard radiological techniques.

SE is not an uncommon condition including several cases described in literature.

In 2013, Aghajanzadeh *et al.* proposed an anatomical classification of SE in five grades including: (1) base of neck, (2) the whole neck area, (3) subpectoralis major area, (4) chest wall and all of neck area, (5) chest wall, neck, orbit, scalp, abdominal wall, upper limbs and scrotum [6].

Following this classification, the patient herein described scored a grade 5 SE.

However, although of undoubted value, it should be noted that this classification is essentially anatomical and does not take into account the patients' outcome.

The management of SE may vary from a 'wait and see' approach, for mild cases, to an immediate intervention in patients with hemodynamic instability [7,8].

In the latter cases, SE the treatment is aimed to a rapid decompression of airways and main blood vessels by removing air from soft tissues, while supporting vital function.

So far there are no outcome differences should infraclavicular incision, subcutaneous drain or suction-on in situ chest drain be applied [3].

In our experience, a subcutaneous drain coupled with a compressive massage appeared to be a successful and easily applicable approach in the emergency setting leading to a fast improvement of the patient's vital signs [9,10].

## Conclusion

The experience gained with this case suggests the importance of a correct clinical decision in the management of SE.

Currently, there are no data correlating anatomo-clinical categorization with outcome and treatment of patients with SE.

Based on an appropriate clinical grading, a "tailored-treatment" may be considered.

This approach might be useful for emergency physicians considering the dramatic complications SE could assume.

## Conflict of Interest

None to declare.

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