

## An unusual cause of subcutaneous emphysema, pneumomediastinum and pneumoperitoneum

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*An unusual cause of subcutaneous emphysema, pneumomediastinum and pneumoperitoneum. W.G. Boersma, J.P. Teengs, P.E. Postmus, J.C. Aalders, H.J. Sluiter.*

**ABSTRACT:** A 62 year old female with subcutaneous emphysema, pneumomediastinum and pneumoperitoneum, was observed. Pneumothorax, however, was not present. Laparotomy revealed a large infiltrate in the left lower abdomen, which had penetrated the anterior abdominal wall. Microscopically, a recurrence of previously diagnosed vulval carcinoma was demonstrated. Despite intensive treatment the patient died two months later.

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The main cause of subcutaneous emphysema is a defect in the continuity of the respiratory tract. Gas in the soft tissues is sometimes of abdominal origin. The most frequent source of the latter syndrome is perforation of a hollow viscus [1]. In this case report we present a patient with an intra-abdominal extension of a vulva carcinoma, which eventually led to subcutaneous emphysema, pneumomediastinum and pneumoperitoneum. Direct perforation of the infiltrate into the peritoneal cavity was not demonstrated.

### Case Report

In October, 1986, a 62 year old woman was referred to the Department of Obstetrics and Gynaecology with fever and pain localized in the left lower abdomen.

She had been operated on in July, 1985, because of a vulva carcinoma stage II, with bilateral inguinal lymph node metastases. After radical vulvectomy and bilateral inguinal lymphadenectomy, she received radiotherapy (50 Gy) on the tumour sites. In July, 1986, the patient was admitted to the hospital because of a swollen, painful left leg. Occlusion of the left femoral vein was diagnosed and treated with acenocoumarol. Both physical examination and computer tomography (CT) demonstrated no signs of tumour recurrence.

The pain in the lower abdomen and fever had been present for three weeks. The general practitioner had prescribed trimethoprim because of the symptoms of an urinary tract infection. In spite of this treatment, fever persisted. Besides constipation, the patient had no other complaints. On admission, the patient was in good physical condition. The temperature fluctuated around

38°C. There were loud bowel sounds and abdominal distension. The left lower quadrant of the abdomen was tender, with dullness on examination. Recto-vaginal examination revealed no abnormality. The left upper leg had increased in circumference. Laboratory investigations showed ESR 91 mm·hr<sup>-1</sup>, white blood cell count  $7.1 \times 10^9 \cdot l^{-1}$  and haemoglobin 119 g·l<sup>-1</sup>. The other laboratory data were within the normal range. A culture of the urine was sterile. A CT-scan of the lower abdomen showed, in the left fossa inguinalis, a conglomerate of bowel with herniation of this mass into the inguinal canal. There were no signs of incarceration (fig. 1). A Doppler procedure of the left upper leg demonstrated a post-thrombotic venous occlusion, unchanged from the results of a previous investigation.



Fig. 1. - CT scan of the lower abdomen showing a large infiltrate with gas containing structures on the left side.

Seven days after the admission subcutaneous emphysema of the thorax and neck was found. There were no signs of a pneumothorax. The chest roentgenogram showed not only subcutaneous emphysema, but also a pneumomediastinum and pneumoperitoneum (fig. 2).

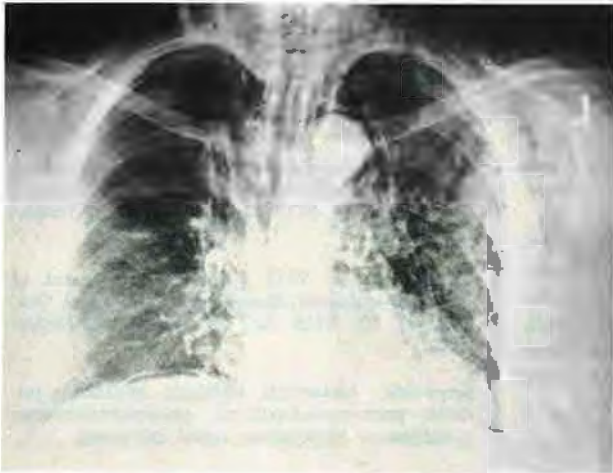


Fig. 2. - Chest roentgenogram demonstrating subcutaneous emphysema, a pneumomediastinum and a pneumoperitoneum.

After starting antibiotic therapy a laparotomy was performed. A large infiltrate in the left lower abdomen with perforation of the sigmoid colon into the inguinal region was found. The abdominal wall showed an abscess containing pus. The peritoneal cavity was not contaminated, but contained a small quantity of free gas. A Hartmann procedure was performed with a left hemicolectomy and resection of the infected abdominal wall. Postoperatively, subcutaneous emphysema resolved rapidly. Microscopically there was extensive infiltration of the wall of the rectum and sigmoid colon by squamous cell carcinoma. Cultures of the pus yielded a mixed flora of aerobic and anaerobic bacteria, all of which were sensitive to the antibiotic therapy already started preoperatively. However, the patient's condition deteriorated gradually and she died two months after admission. Autopsy was not performed.

### Discussion

In most cases subcutaneous emphysema is of respiratory origin. If over-distended alveoli rupture because of the existence of a pressure gradient between the alveolus and the surrounding structures, with or without rupture of the pleura visceralis, air can flow along the broncho-vascular sheaths to the mediastinal and subcutaneous tissues [1-3]. When mediastinal pressure rises further, retroperitoneal emphysema and pneumoperitoneum may occur [4]. Well known intrathoracic causes of subcutaneous emphysema are Valsalva's manoeuvre, severe bronchoconstriction (asthma), artificial ventilation with high positive end-expiratory pressure or high peak inspiratory pressure, decompression, and blast injury compression [2]. Other more local causes of subcutaneous emphysema are soft-tissue infections, directly

penetrating trauma or surgical intervention of gas-containing structures, and a rare kind of mucosal interruption (e.g. Boerhaave's syndrome) [5].

Subcutaneous emphysema of abdominal origin is frequently associated with pneumoperitoneum. These symptoms are due to perforation of an abdominal viscus, gas producing organisms, pneumatosis cystoides intestinalis or iatrogenic (e.g. gastroscopy, sigmoidoscopy) [5, 6]. The female genital tract is also a potential source of pneumoperitoneum. Air may pass through the fallopian tubes during examination, douching, salpingitis, post-partum knee-chest exercises, coitus, or after orogenital contact [7].

In our patient, tumour infiltration of the bowel wall was responsible for the perforation and gas leak into the anterior abdominal wall. No bowel perforation into the peritoneal cavity was seen. The gas movement into the peritoneal cavity may have occurred along two routes. Either gas moved directly to the retroperitoneum and peritoneal cavity, or indirectly via the thoracic wall and mediastinum to the retroperitoneum.

This mechanism of abdominal wall emphysema has a close resemblance to that caused by a perinephric abscess and diverticulitis with necrotizing fasciitis [8-10]. The possibility, that gas-producing organisms contribute to the actual gas in the soft tissues as in the patient described can not be excluded, but is probably of minor importance [10]. Because of the high intraluminal pressure, inflammation and tumour infiltration, perforation to the abdominal wall could occur.

Subcutaneous emphysema that develops in this manner is frequently associated with infection of the fascial layers of the abdominal wall. Surgical intervention and antibiotic therapy is the treatment of choice.

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*Cause inhabituelle d'emphysème sous-cutané, de pneumomédiastin et de pneumopéritoine. W.G. Boersma, J.P. Teengs, P.E. Postmus, J.C. Aalders, H.J. Sluiter.*

RÉSUMÉ: Il s'agit d'une observation d'une femme de 62 ans

atteinte d'emphysème sous-cutané, de pneumomédiastin et de pneumopéritoine, mais sans pneumothorax. La laparotomie a montré une large infiltration de l'abdomen inférieur gauche, avec perforation à la paroi abdominale antérieure. L'examen microscopique montre une rechute d'un carcinome vulvaire antérieurement diagnostiqué. La patiente est décédée deux mois après malgré une thérapeutique intensive. *Eur Respir J.*, 1988, 1, 969–971.