



Case Report

Case Report: Post-Hemihepatectomy Diaphragmatic Hernia Presenting as Tension (faeco-) Pneumothorax

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Abstract

A 73-year-old patient was presented from the rehabilitation clinic via the emergency department. The patient had been admitted for rehabilitation after a right hemihepatectomy four months before. After admission despite calculated antibiotic therapy and oxygen administration, the patient's condition worsened peracutely on the following day with clinical dyspnoea, tachycardia, hypotension and somnolence and now also vomiting and diarrhoea. The emergency chest X-ray showed a tension pneumothorax on the right side with severe mediastinal displacement. After emergency thoracal-drainage, abundant brown secretions were discharged. The subsequent CT scan revealed the cause: a diaphragmatic defect with herniation of the right colonic flexure and subsequent gangrene, which had led to perforation and finally to a faecal pleurisy and peritonitis. Exploratory laparotomy, right hemicolectomy, transdiaphragmatic decortication and lavage with drainage and subsequent diaphragmatic reconstruction were performed. Diaphragmatic injuries after partial liver resection are a rare but life-threatening complication, which can also occur at different times. In the case of tension pneumothorax, a diaphragmatic injury should always be considered, which can occur post-traumatically, postoperatively or post-interventionally.

Keywords: Colonic perforation postoperative; Diaphragmatic hernia; Faeco-thorax; Pleural empyema; Post-hemihepatectomy; Tension pneumothorax

Clinical History and Findings

A 73-year-old female patient of BMI 18,4 kg/m² was presented from the rehabilitation clinic via the emergency department. The patient had been admitted for rehabilitation after a right hemihepatectomy four months before plus adjuvant chemotherapy with capecitabine for intrahepatic cholangiocellular carcinoma. The patient's medical history revealed a progressive pleural effusion on the right side in the last few weeks, accompanied by increased infection parameters and right flank pain. Under suspicion of

nosocomial pneumonia with respiratory deterioration, the patient was admitted to the internal medicine ward under COVID19 isolation conditions. Sonographically, a pleural empyema was suspected on the right side. Despite calculated antibiotic therapy and oxygen administration, the patient's condition worsened peracutely the following day with clinical signs of dyspnoea, tachycardia, hypotension and somnolence, and now also vomiting and diarrhoea. Retrospectively, the patient's medical history revealed that she had been vomiting recurrently for several days. The emergency chest X-ray showed a tension pneumothorax on the right side with severe mediastinal displacement (see Figure 1). Laboratory tests revealed a leucocytosis (16.000/μl) and a relevant CRP elevation of 253 mg/l.

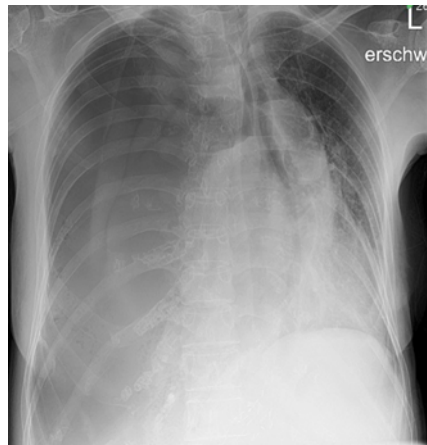
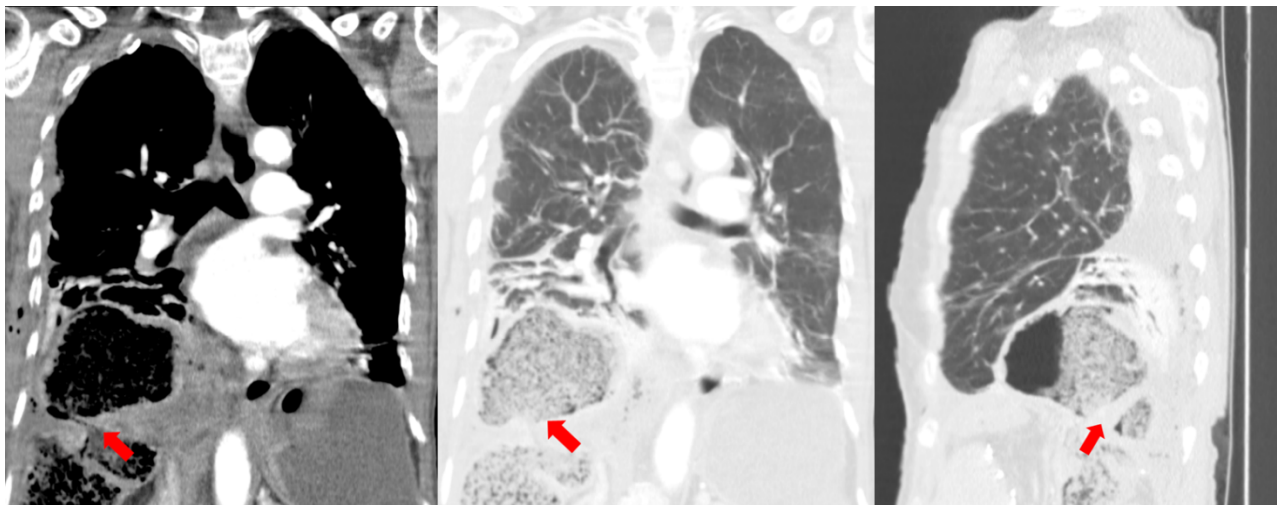


Figure 1: Primary X-ray showing severe mediastinal displacement in tension pneumothorax.

Acute Therapy

On arrival of the surgeon, the patient was in circulatory shock with marbled extremities and pronounced respiratory exhaustion. The first step was to puncture the patient with a large lumen venous cannula according to Monaldi and to increase the oxygen substitution up to 10l/min via mask. After stabilisation a thoracic drainage tube according to Bülow was inserted under analgesia via a mini-thoracotomy on the right side. Immediately 1500ml of brownish foetid smelling secretions without solid parts were discharged. After further stabilisation on the ICU the following CT scan of the thorax and abdomen revealed an incarcerated right colonic flexure in a diaphragmatic defect on the right side with a possible perforation of the incarcerated colon and a regular position of the drainage without reference to the colon (see Figures 2a-c).

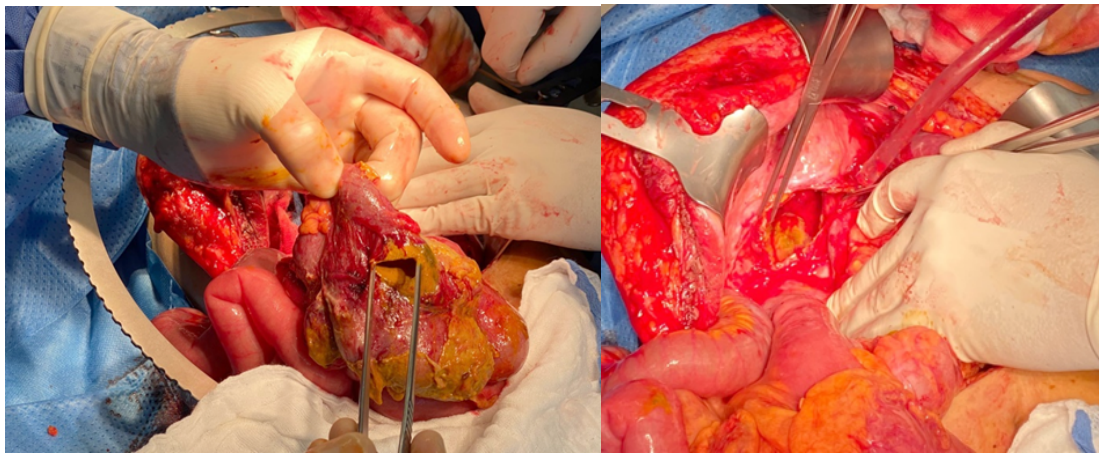


Figures 2: CT Scans a-c (a-coronal abdominal window with arrow at diaphragmatic defect and incarceration of right colon, b:-coronal pulmonary window, c-sagittal)

Surgical Therapy

After stabilisation and CT findings, the patient underwent emergency surgical treatment via the pre-existing right-sided door incision. Intraoperatively, a postoperative right diaphragmatic defect with trapped right colonic flexure and subsequent colonic perforation as well as faecal pneumothorax due to intestinal gases was found (see Figures 3a,3b). In addition to the stool-like pleural empyema, there was stool-like peritonitis and concomitant small bowel ileus. Exploratory laparotomy, right hemicolectomy, transdiaphragmatic decortication and lavage with drainage and subsequent diaphragmatic reconstruction were performed. After exploratory laparotomy

with drainage placement, the patient was managed in our ICU ward. In case of cardiopulmonary insufficiency, acute renal failure AKIN III as well as electrolyte imbalance in the context of the septic event, stabilization by means of volume and catecholamine therapy as well as ventilation therapy was performed. Extubation was finally achieved on the second postoperative day so that the patient could finally be transferred via IMC to the normal ward. Both abdominal and thoracic drains were showing serous secretions, and the patient received antibiotic shielding using piperacillin/tazobactam as well as respiratory therapy. Since *E. coli* and *C. albicans*, among others, were detected in the drainage secretions, antibiotic treatment was extended to fluconazole and meropenem. The chest drains and the abdominal drain were successively removed. The radiographic examinations performed revealed no evidence of recurrent pneumothorax. In the subsequent laboratory chemical controls, persistently high infection values were found, so that a new CT examination was performed. This revealed multisite, partially encapsulated lesions in the sense of incipient pleural empyema. The patient was then presented to the thoracic surgery and underwent thoracoscopic removal of the empyema. The patient recovered completely and is attending her oncological follow-ups in a good clinical condition (see Figures 4a,b).



Figures 3a,3b: Intraoperative findings: left picture:- perforated right-colonic flexure, right picture:- diaphragmal defect causing the incarceration.



Figures 4a,4b: Patient fully healed and recovered postoperatively.

Discussion

Diaphragmatic hernias occur as a result of direct or indirect trauma [1]. Diagnosis is often delayed, and in many cases they are discovered only as incidental findings. Sometimes decades pass before the diagnosis is made. Very rarely, diaphragmatic hernia is associated with faecal tension pneumothorax. So far, only 12 cases have been described in the literature over the past [2]. The long latency period, which can last up to 46 years, is also striking in the case presented here [2]. In the patient's history there was no evidence of blunt abdominal trauma as a possible cause of a right-sided direct diaphragmatic hernia. Thus, in this case, the hernial orifice must be urgently assumed to be a residual of the right hemihepatectomy performed four months previously, possibly also bilaterally after surgical mobilisation at the centrum tendineum of the diaphragm. In this case we suppose that due to thermal alteration of the diaphragm

during the right hemihepatectomy, the diaphragm tore locally in the early postoperative course. Since traumatic diaphragmatic hernias anatomically are more likely to develop on the left than on the right, there is much to be said in this case for the above mentioned genesis, as described in 1.6% of cases after liver resections [3]. In the case of right-sided injuries of the diaphragm, herniation of the liver predominates [1]. In rare cases, however, even small injuries can remain asymptomatic for a long time and then develop into a severe complication in the course of time until they lead to infarction or ileus in the case of incarceration of the small intestine or colon. The treatment of choice is laparotomy, because there are often other intra-abdominal injuries that require surgical treatment. In some cases, an additional thoracotomy is necessary, because especially longer existing hernias can develop intrathoracic adhesions [4]. For reconstruction of the diaphragm, non-absorbable sutures in single button technique or as continuous sutures are chosen, and in large defects, coated mesh fabrics are used as interposition devices [4]. In this case, mesh could not be used due to contamination with faeces. In addition to surgical intervention, lavage and drainage, and antibiotic therapy, tPA (tissue-specific plasminogen activator) can also be injected supportively to aid fibrinolysis in pleural empyema [5].

Conclusion

In patients with peracute tension pneumothorax after right sided hemihepatectomy, primary care doctors should also consider a diaphragmatic postoperative injury, which can occur even with

a long delay post-traumatically or also iatrogenically, especially if there are conspicuous findings in the thoracic X-ray. Perforation of hollow organs is a rare cause but may be the underlying cause of a tension component. In the case of seropneumothorax or pleural empyema, diaphragmatic injury should be excluded accordingly, even if there are no abdominal symptoms (lack of clinical implications for peritonitis. Prompt CT diagnosis is of primary importance in order to be able to provide the patient with the correct diagnosis and therapy.

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