CASE REPORT

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LEFT-SIDED LUNG ABSCESS, COMPLICATED WITH BRONCHOPERITONEAL FISTULA: CASE REPORT

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Abstract. *Bronchogenic lung abscess complicated by the development of a bronchoperitoneal fistula is an extremely rare and potentially life-threatening condition. It may be associated with severe sepsis, air leakage, and often requires urgent surgical treatment supported by an interdisciplinary team and intensive care management. We present a case of an 18-year-old male patient who was transferred to our institution with a left lower lobe lung abscess, developed secondary to massive bilateral pneumonia, and complicated by bronchoperitoneal fistula formation, diffuse fibrinopurulent peritonitis, and pneumoperitoneum. Complex surgical treatment was performed, followed by intensive postoperative care. The patient was successfully discharged on the 23rd postoperative day.*

Key words: *bronchial fistula, bronchoperitoneal fistula, lung abscess, necrotizing pneumonia, pleural empyema*

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INTRODUCTION

Inflammatory diseases of the lungs and pleura are increasingly encountered nowadays. Late hospitalizations, prolonged conservative treatment, together with the development of severe sepsis, are factors that potentially lead to complications [1].

Lung abscess is defined as a cavity in pulmonary parenchyma, resulting from tissue inflammation and necrosis, caused in the majority of cases by polymicrobial pyogenic bacteria: aerobic gram-negative and anaerobic bacteria [2]. According to different classifications, lung abscesses could be divided into acute, which last for less than 4 weeks, and chronic; bronchogenic and hematogenous; primary, in cases without underlying pulmonary pathology, and secondary. Risk groups for lung abscess formation include immunocompromised patients such as the elderly, drug and alcohol abusers, patients on corticosteroid or cytostatic therapy, patients with malnutrition, diabetes mellitus, COPD, etc. [3].

In the present report, we describe a case of a young patient with a rare complication of bilateral lobar pneumonia – bronchogenic lower lobe lung abscess and bronchoperitoneal fistula, developed after surgical drainage of ipsilateral subphrenic abscess, performed in another hospital. Bronchoperitoneal fistulas are extremely rare and may be difficult to diagnose. Due to the involvement of both thoracic

and abdominal cavities, such patients often require urgent surgical treatment in multiprofile hospitals by multidisciplinary teams.

CASE PRESENTATION

We present a case of an 18-year-old male patient who was transferred to our hospital from another clinic, where he was admitted due to massive bilateral pneumonia and a left-sided lung abscess, complicated with subphrenic collection under the left diaphragmatic dome. According to the anamnesis, the patient's complaints started 10 days before initial hospitalization and included high fever, cough with purulent secretions, shortness of breath, and fatigue. After preoperative preparation, surgical treatment was performed, which included laparotomy, sanitation of the subphrenic abscess, lavage, and subphrenic drainage placement. During the postoperative period, free air from the abdominal drainage was noticed, which led to relaparotomy on the second day after the first surgery. During revision, ulcus pyloricum perforatum was found, and pyloroplasty was performed. Additional abdominal drainages were placed: one located in the area of pyloroplasty, one in the pelvis, and one placed in the bursa omentalis. During the same operative time, thoracocentesis was performed on the left side, and thoracic drainage was inserted. After the second intervention, a persistent massive air leak from the abdominal drainages was still observed, and the decision about transfer to our hospital was made.

The patient was admitted to our hospital on the 4th day after revision analgosedated and intubated (CMV 60%), hemodynamically unstable, with blood pressure of 200/100 mmHg and heart rate of 110/min, subfebrile. Blood tests revealed signs of systemic inflammatory process and acidosis, Table 1.

SOFA score on the day of the admission: 9.

The CT scan showed consolidation of lower lobes of the lung parenchyma bilaterally and the presence of a lung abscess of segments 9/10 on the left side, signs of massive bilateral pneumonia, a significant amount of free air in the abdominal cavity, fluid collection in the pelvis, and a residual collection of 30x30x5 mm under the left diaphragmatic dome (Fig. 1).

After discussion and preparation, the decision about surgical treatment was made. When performing relaparotomy, free air under pressure was relieved from the operative wound. Fasciitis with partial necrosis of the aponeurosis was observed. Diffuse fibrinopurulent peritonitis caused by the abscess of the lower lobe of the left lung, drained through the diaphragmatic lesion into the abdominal cavity – presence of the bronchoperitoneal fistula was confirmed; the suture of the pylor ulcus was found intact. Debridement of the adhesions was performed and the decision about further thoracotomy was made (Fig. 2).

Table 1. Laboratory investigations at the day of the admission

Parameters	Patient values	Reference range	Parameters	Patient values	Reference range
White blood cells	20.6	3.50-10.80x10^9/L	Albumin	30	35-50 g/L
Neutrophils, absolute count	17.5	2.00-7.00x10^9/L	Protein total	74	64-83 g/L
Neutrophils (%)	84.6	37.6-78.7%	C-reactive protein	16.24	<0.5 mg/dL
Platelets	322	112-330x10^9/L	Glucose	8.39	3.50-6.10 mmol/L
Hemoglobin	129	115-150 g/L	Procalcitonin	8.17	<0.05 ng/mL
Hematocrit	0.43	0.350-0.490 L/L	Lactate Dehydrogenase	283	135–225U/L
pH (Potential of Hydrogen)	7.25	7.35–7.45	Creatine kinase	287	30–200 U/L
pO_2 (Partial Pressure of Oxygen)	63.19	75–100 mmHg	Creatine kinase-MB	0.4	<5 ng/mL
pCO_2 (Partial Pressure of Carbon Dioxide)	138.69	35–45 mmHg	Alanine aminotransferase	46	Up to 41.00 U/L
HCO_2 (Bicarbonate)	58.9	22–28 mmol/L	Aspartate aminotransferase	39	Up to 40.00 U/L
SBC (Standard Bicarbonate Concentration)	66.4	22–28 mmol/L	Amylase	260	30–110 U/L
BEb (Base Excess in Blood)	25.2	-2 to +2 mmol/L	Creatinine	72.0	Up to 134.00 µmol/L
BEecf (Base Excess in Extracellular Fluid)	31.7	-2 to +2 mmol/L	eGFR (Estimated Glomerular Filtration Rate)	129	>90 mL/min
tCO_2 (Total Carbon Dioxide)	62.4	23–29 mmol/L	Activated Partial Thromboplastin Time (sec.)	33.7	25–35 sec
O_2Sat (Oxygen Saturation)	86.0	95–100%	Activated Partial Thromboplastin Time (ratio)	0.99	0.8–1.2
Lactate	1.4	0.5–2.2 mmol/L	INR (International Normalized Ratio)	1.37	0.8–1.2
			Fibrinogen	5.43	2.0–4.0 g/L
			D-dimer	1817.0	<500 ng FEU/mL
			Prothrombin time (sec.)	15.2	11–15 sec
			Prothrombin time (%)	64.83	70–120%

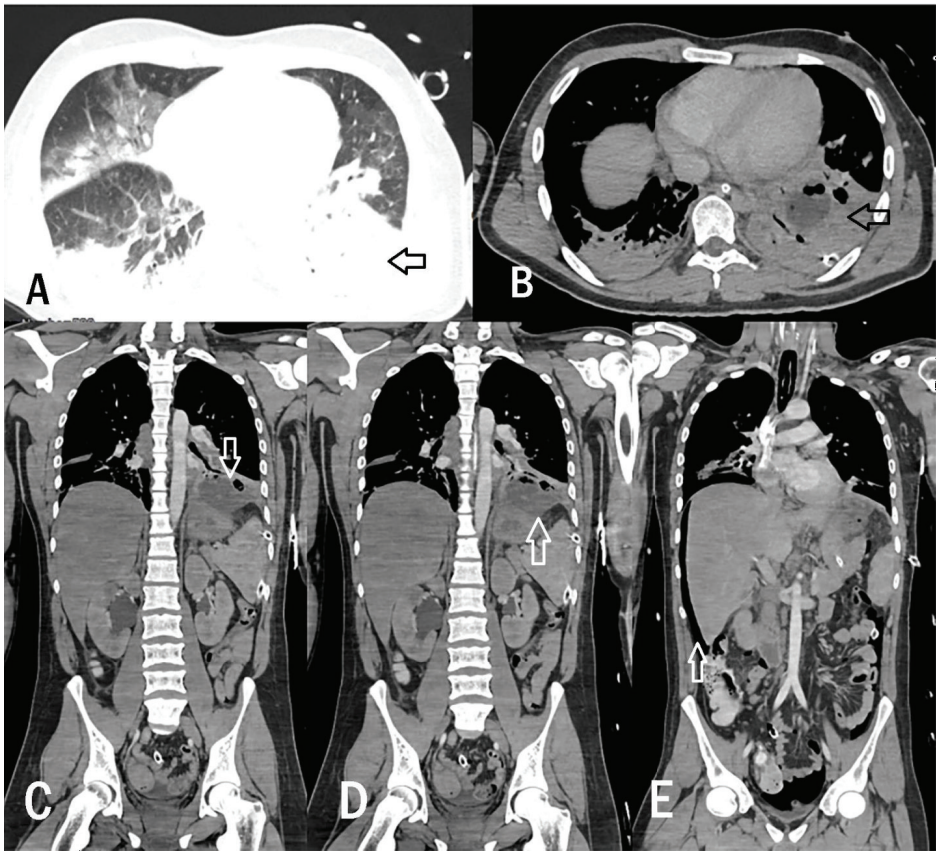

Fig. 1. Preoperative Computed Tomography (CT) of the patient after the admission to our hospital. Axial view, with black arrows indicating lung abscess: **A** – lung window, **B** – mediastinal window Coronal view, with white arrows indicating residual subdiaphragmatic collection of 30x30x5mm, communicating with the lower lobe lung abscess (**C, D**), and free air in the abdominal cavity (**E**)

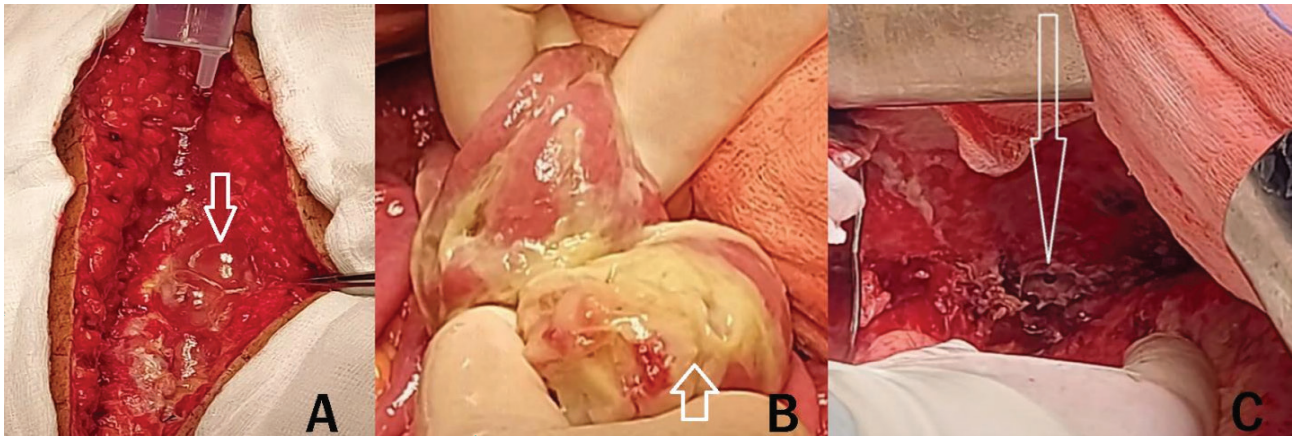

Fig. 2. Intraoperative findings during relaparotomy, performed in our hospital. White arrows indicating: **A** – air bubbles coming out of the wound while performing relaparotomy. **B** – fibrin deposits on the small bowel as a sign of fibrinopurulent peritonitis. **C** – lesion of the left diaphragmatic dome seen during the abdominal exploration

The patient was reintubated with a double-lumen intubation tube and rotated on the operating table 45° to the right side, which allowed a left anterolateral thoracotomy in the 7th intercostal space to be performed. Stage 3 pleural empyema and massive adhesions with partial obliteration of the thoracic cavity were found. After adhesiolysis and decortication, the lower lobe abscess was reached. After the sanation of the abscess cavity, the bronchial fistula opening to the fundus of the abscess cavity was localized, and the fistula was sutured. Marsupialization of the cavity was performed. Additional sutures of the lower lobe parenchyma were made to achieve satisfactory aerostasis. The diaphragmatic lesion was sutured, with diaphragm plication performed to avoid further weakening and possible herniations. Lavage of the thoracic cavity with antiseptic solutions was performed. Two thoracic drainages, Fr 30 and Fr 28, were placed dorsally and ventrally to the lung parenchyma, and the thoracotomy was closed in a standard manner. 4 drainages, Fr 28, were placed in the abdominal cavity: 2 located under the left diaphragmatic dome, 1 in the left lateral canal, and 1 in the cavum Douglasi. Laparotomy was closed after debridement of the necrotic tissues in a standard manner (Fig. 3).

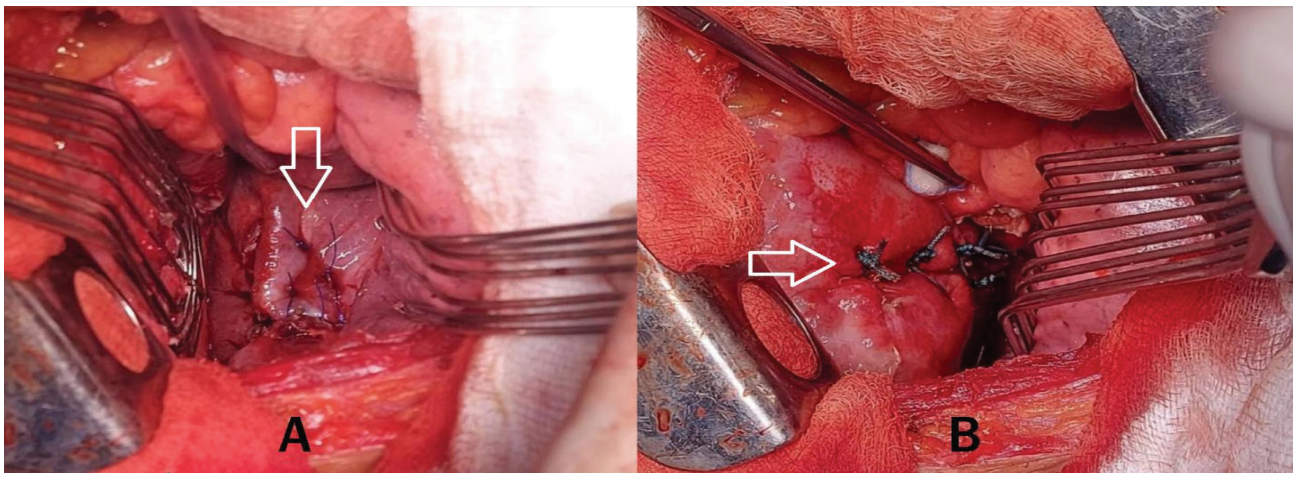

Fig. 3. Intraoperative images after fistula closure. White arrows indicating marsupialization of the abscess cavity (**A**) and diaphragm plication (**B**) performed through the left anterolateral thoracotomy

Due to acidosis and sepsis, the patient was admitted to the intensive care unit postoperatively. Microbiological investigation of the material from pleural exudate revealed Staphylococcus haemolyticus infection; hemoculture showed growth of the Staphylococcus Coa(-) MRS, materials from the intubation tube showed multiresistant Serratia marcescens, Pseudomonas aeruginosa. Conservative postoperative treatment, which included a combination of colistin, linesolid, vancomycin and diflucan was applied. The X-ray, performed on the 2nd postoperative day showed satisfactory lung expansion with signs of pleural effusion on the left side (Fig. 4A). On the 17th postoperative day, the patient was extubated and transferred to the surgical department the next day for further treatment and rehabilitation (Fig. 4B). On the 23rd postoperative day after the control chest X-ray, the patient was discharged without any signs of respiratory failure, afebrile, with primary healed wounds. One month after hospital discharge the patient had fully recovered, was in good general condition, without any signs of infection or shortness of breath. A control chest X-ray showed the lungs fully expanded without any infiltrative opacities or pleural effusions (Fig. 4C).

DISCUSSION

The number of patients with inflammatory lung diseases and pleural empyema has been progressively increasing worldwide during the last years. Lung abscesses which develop due to hematogenous dissemination are much more common in male patients over 60 years of age, especially smokers or alcohol addicts with such comorbidities as diabetes, chronic obstructive pulmonary disease, cardiovascular diseases, etc. [4]. On the other hand, abscesses with bronchogenic etiology are more likely to occur in younger patients without underlying lung pathologies and often are caused by Staphylococcus aureus or Streptococcus spp. [2, 5].

Immunocompromised patients on prolonged mechanical ventilation who develop ventilator-associated nosocomial pneumonia are another risk group to further develop lung abscesses [6].

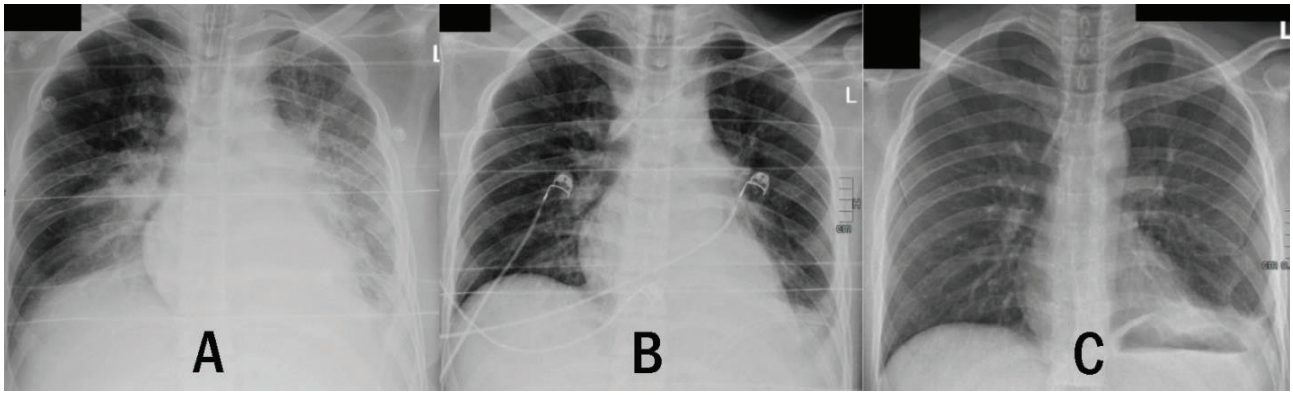

Fig. 4. Postoperative chest X-rays demonstrating lung expansion, anteroposterior view: **A** – 2nd day, **B** – 18th day, **C** – 1 month after discharge

Development of bronchial fistulas is a potentially life-threatening complication of such inflammatory pulmonary diseases as necrotizing pneumonia, lung abscess, pleural empyema. In the majority of cases bronchopleural fistulas are typically formed. Treatment approaches in those cases include a variety of conservative strategies, from high-frequency oscillatory ventilation followed by lung isolation, usage of bronchial stents, valves, occluders, local insertion of fibrin glue, etc., and surgical closure strategies-fistula suture with or without additional coverage with pleura, muscular or omental flap, etc. [7-10].

Bronchopericardial fistulas as a complication of necrotizing pneumonia that leads to acute pericarditis, tension pneumopericardium, atrial fibrillation, or cardiac arrest are described in the literature. Such cases are associated with high mortality and often require emergency decompression, pericardial drainage placement, and aggressive antibiotic treatment [11-13].

Some authors report bronchobiliary fistula formation secondary to liver metastases or hepatocellular carcinomas, biliary stenosis, hepatic hydatidosis, cholangiolithiasis, traumas, and chronic pancreatitis, occurring with the frequency of 32%, 18%, 12%, 10%, 3% of all described in the review. Primary presentations of such fistulas include biliptysis, fever, icterus, abdominal and chest pain, and respiratory disorders [14-16].

Bronchoperitoneal fistulas develop extremely rarely and could be associated with the presence of pneumoperitoneum, subphrenic abscesses, or local, diffuse, or even total peritonitis. In some cases, there is a descending pathway of the formation of such fistulas, which is often related to prolonged mechanical ventilation and necrotizing pneumonia or the presence of lung abscess [15]. Thoraco-abdominal traumas, biliary tract obstruction and infection, or some malignancies may play a role in pathogenesis [17,18]. On the other hand, retained abdominal drainages, if placed in subdiaphragmatic spaces, could potentially cause diaphragmatic erosion and take a role in fistula formation, especially in the conditions of infectious inflammation [17]. Treatment approaches could be similar to those used in cases of bronchopleural fistulas, like endobronchial valve placement, but in association with lung abscess and peritonitis, as in the described case, urgent surgical intervention and sanation of both abdominal and pleural cavities is required [19-21].

CONCLUSIONS

Bronchoperitoneal fistulas secondary to destructive inflammatory pulmonary diseases, unlike bronchopleural, are extremely rare. In the described case, such pathological communication between the pleural and abdominal cavities occurs as a result of massive pneumonia and left lower lobe abscess formation, and in association with primary surgical intervention-subphrenic abscess drainage. In our opinion, urgent surgical treatment in such cases, performed by an interdisciplinary team, is essential for successful sanitation of both pleural and abdominal cavities and prevention of sepsis.

Early hospitalization and adequate conservative and surgical treatment of patients with inflammatory diseases of the lungs and pleura may prevent the development of further complications such as bronchoperitoneal fistula formation and severe sepsis.

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