

CASE REPORT

FATAL PULMONARY BILE EMBOLISM ASSOCIATED WITH ACUTE PANCREATITIS – A CASE REPORT AND REVIEW OF THE LITERATURE

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A 27-year-old woman with jaundice and abdominal pain was admitted to an emergency ward. The diagnostic process showed that gallstones were causing her symptoms. The patient was treated *via* endoscopic retrograde cholangiopancreatography (ERCP), and during the procedure she suffered a cardiac arrest. Autopsy findings included multiple pulmonary bile emboli as well as features of disseminated intravascular coagulation. Among 22 thus far described cases of bile pulmonary embolism, 13 were associated with medical procedures involving the liver and biliary tract. We present the case report of a pulmonary bile embolism associated with acute pancreatitis treated *via* ERCP in a woman with gallbladder bile stones.

Key words: ERCP, pancreatitis, pulmonary bile embolism.

Introduction

Pulmonary embolism can be divided into thrombotic and non-thrombotic. The latter, which is less frequent, can be caused by a variety of agents, including fat, tumour cells, amniotic fluid, air, and foreign bodies.

A pulmonary bile embolism is a rare form of non-thrombotic pulmonary embolism. This pathological entity was first identified in the early 1950s by Brown *et al.*, who described it in the autopsy of a 67-year-old male with ampullary cancer [1]. Since then, only 22 cases of bile pulmonary embolism (BPE) have been described prior to our case report [2].

Case report

An obese 27-year-old woman was admitted to an emergency ward complaining of epigastric pain that had lasted for 5 days. On the second day, she had also experienced vomiting. The patient was conscious and well oriented. She reported no prior chronic illnesses.

On physical examination, findings included tachycardia (120/min), jaundice, and tenderness of the upper part of the abdomen.

Blood samples were tested for the presence of pancreatic enzymes. Amylase level was 706 U/I and lipase level was 514 U/I, both 3 times their normal values.

Ultrasound imaging of the abdomen showed the presence of gallstones in the gallbladder and dilation of the common bile duct. In addition, small amounts of fluid were seen in the left pleural cavity, Morrison's pouch, and omental bursa. Other organs showed no signs of pathology.

Based on biochemical and clinical tests, as well as ultrasound imaging, the patient was diagnosed with acute pancreatitis caused by gallstones blocking the common bile duct.

Endoscopic retrograde cholangiopancreatography (ERCP) was then recommended and subsequently conducted. The endoscope was inserted into the duodenum, and the common bile duct was catheterised. Contrast dye was injected revealing multiple concretions in the biliary tract. Therefore, papillotomy was performed allowing the evacuation of some gallstones *via* the Dormia basket.

During this procedure, the patient's saturation and heart rate suddenly dropped, prompting immediate intubation and resuscitation. Electrocardiogra-

phy revealed pulseless electrical activity, which then transitioned into asystole. Despite ongoing resuscitation, the patient was pronounced dead.

An autopsy was requested to determine the cause of death.

The corpse of the female patient was examined. Exact mass and height were not measured. Jaundice was starkly apparent in the sclerae and to a lesser extent in the skin.

Abdominal examination revealed the presence of 50 ml of blood-tinted fluid in the peritoneal cavity. In the liver parenchyma, multiple, dispersed, yellow foci less than 1 cm in diameter were observed. The gallbladder contained a large number of stones of various sizes (3–12 mm). The biliary tract was found unobstructed, and the ampulla of Vater was cut open. The pancreas had a firm consistency, revealing areas of haemorrhage upon cross-section as well as multiple white, round foci consistent with fat necrosis. Similar lesions were observed in the mesentery of the colon. In both pleural cavities, we found approximately 50 ml of reddish fluid. The pleurae were smooth, dull, and without adhesions. Both lungs were congested and released small amounts of reddish, translucent fluid upon cross-section. Gross findings in other organs were unremarkable.

Tissue samples from the heart, lungs, liver, pancreas, gallbladder, kidneys, brain stem, ovaries, and uterus were taken and processed onto glass slides for microscopic examination. These histologic specimens were then examined under a microscope. The lung samples showed congestion, focal atelectasis, and multiple bile emboli in small and medium-sized arteries (Figs. 1, 2). In addition, small thrombi were present in the vessels of many organs: lungs, pancreas (Fig. 3), liver, heart, and kidneys. The samples taken from the pancreas showed the presence of acute necrotizing/haemorrhagic pancreatitis. In the peripancreatic fat and colon mesentery multiple foci of fat necrosis were present. In both lobes of the liver, multiple metastatic microabscesses were found. The samples of the gallbladder showed the presence of chronic inflammation of the mucosa. The heart muscle of the left ventricle had foci of subendocardial fibrosis. Other organs showed only the signs of congestion and starting autolysis.

Acute respiratory failure caused by massive bile embolism of the pulmonary vessels accompanied by disseminated intravascular coagulation (DIC) was recognised as the cause of the patient's death.

Obtaining the patient's informed consent for the above study was not possible due to her death.

Discussion

Acute pancreatitis is a common clinical condition with a variety of associated causes; the most com-

mon include chronic alcohol abuse and gallstones [3]. Pathophysiologically, the premature activation of pancreatic enzymes is the basis for the inflammatory process. The inflammation may be limited to the pancreas or it may spread to peripancreatic

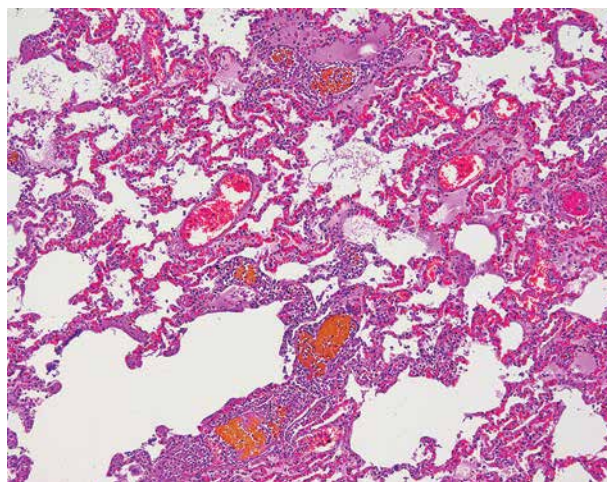


Fig. 1. Lung: multiple bile emboli in small and medium-sized arteries (HE, 10×)

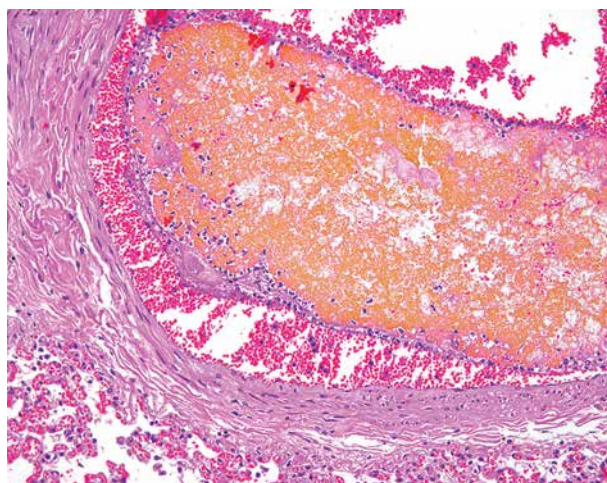


Fig. 2. Lung: bile embolus in medium-sized artery (HE, 40×)

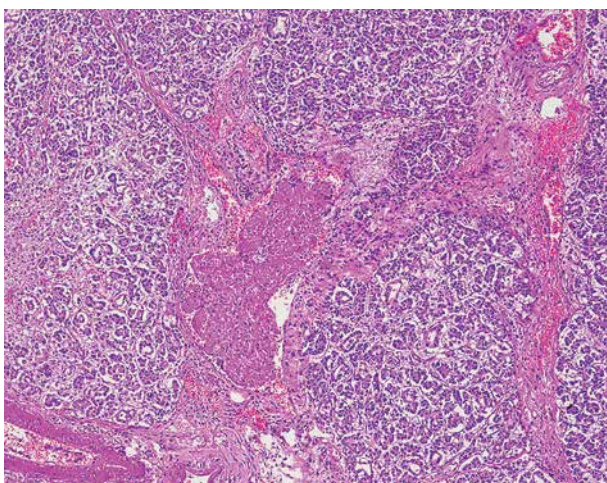


Fig. 3. Thrombus in small vessel in pancreas (HE, 10×)

tissues. The patient typically presents with sudden onset of upper abdominal pain, nausea, vomiting, fever, and severe abdominal tenderness [4]. While there is no pathognomonic laboratory sign of acute pancreatitis, lipase or amylase levels 3 times greater than normal are considered diagnostic [5]. Tools such as the Atlanta criteria, the APACHE II scoring system, and the Ranson score are used to determine the severity of the disease and the likelihood of complications [3]. Depending on the determined cause and severity of the patient's condition, they might be treated conservatively, *via* cholecystectomy or ERCP with sphincterotomy, the latter being recommended for patients with evidence of biliary obstruction.

In the presented case, BPE developed in a patient with acute pancreatitis caused by gallstones trapped in the common bile duct. Our patient was treated with an ERCP procedure. This rare condition can develop when a breach occurs between the vascular and biliary systems either intra- or extrahepatically. In a patient with cholestasis, the pressure in a bile duct can be higher than in the venous system, so if a communication between these 2 is created, bile may leak into the systemic circulation and result in subsequent BPE.

A variety of underlying causes of BPE have been reported (Table I). These include abdominal trauma [2, 6–8], liver metastases [9], liver abscesses [9, 10], cholecystitis [11, 12], and a variety of iatrogenic

Table I. Cases of pulmonary bile embolism

No	STUDY	SEX	AGE	UNDERLYING PATHOLOGY
1	Brown <i>et al.</i> [1]	Male	67	Ampullary carcinoma, needle biopsy
2	Mehta <i>et al.</i> [9]	Female	54	Liver metastases
3	Mehta <i>et al.</i> [9]	Male	80	Liver abscesses
4	Doyle <i>et al.</i> [6]	Male	24	Liver firearm injury
5	Vestfrid <i>et al.</i> [10]	Female	34	Liver abscesses
6	Doerig [7]	Female	36	Liver trauma
7	Koehler <i>et al.</i> [13]	Female	33	Pancreas carcinoma, percutaneous transhepatic cholangiography
8	Brozinsky <i>et al.</i> [14]	Male	72	Pancreas carcinoma, percutaneous transhepatic cholangiodrainage
9	Armellin <i>et al.</i> [15]	Male	69	Pancreas carcinoma, percutaneous transhepatic cholangiodrainage
10	Peven <i>et al.</i> [16]	Male	68	Ampullary carcinoma, percutaneous transhepatic cholangiodrainage
11	Balogh [17]	Male	58	Bile duct carcinoma, percutaneous transhepatic cholangiography
12	Decker <i>et al.</i> [18]	Male	61	Cholecystitis, needle biopsy
13	Proia <i>et al.</i> [19]	Male	52	Postoperative acute acalculous cholecystitis
14	Helpap <i>et al.</i> [20]	Not specified	Not specified	Postoperative acute acalculous cholecystitis
15	Kihira <i>et al.</i> [21]	Male	70	Pancreas carcinoma, percutaneous transhepatic cholangiodrainage
16	Schmidt-Mutter <i>et al.</i> [22]	Male	74	Hepatocellular carcinoma, radiofrequency thermal ablation
17	Siddiqui <i>et al.</i> [23]	Female	43	Ampullary carcinoma, percutaneous biopsy, and endoscopic retrograde cholangiopancreatography
18	Morentin <i>et al.</i> [11]	Female	57	Cholecystitis
19	Medicine, science and law journal	Male	Not specified	Liver stab injury
20	Lorenzo <i>et al.</i> [12]	Male	44	Cholecystitis
21	Jusufi <i>et al.</i> [24]	Male	66	Liver metastases, hepatic microwave ablation
22	Fnon <i>et al.</i> [2]	Male	12	Liver firearm injury
23	Our study	Female	27	Acute pancreatitis, endoscopic retrograde cholangiopancreatography

procedures associated with pancreatic, hepatic, and biliary pathology [1, 13–24]. To the best of our knowledge, this is the first case of BPE in a patient with ERCP-treated acute pancreatitis. The only reported case associated with ERCP was a patient with ampullary cancer [23].

It is worth pointing out that the patient in our case was younger than a typical patient with BPE, considering that all but 2 previous cases concerned individuals older than 30 years. Both of those individuals (aged 12–24 years) suffered of gunshot wounds to the abdomen [2, 6].

This complication, however uncommon, should be kept in mind in case of sudden death in a previously stable patient who underwent an injury/medical procedure concerning pancreaticobiliary structures.

It should also be noted that in our case report we present PBE accompanied by DIC.

Conclusions

Bile pulmonary embolism is an example of non-thrombotic pulmonary embolism. Bile can pass through the bloodstream to the lung if there is an abnormal communication between the hepatobiliary tree and a venous vessel. This communication can occur during different medical procedures or injuries concerning the pancreaticobiliary structures. Bile pulmonary embolism can be associated with DIC.

The authors declare no conflict of interest.

References

- Brown CY, Walsh GC. Fatal bile embolism following liver biopsy. *Ann Intern Med* 1952; 36: 1529-1533.
- Fnon NF, Seleim HM, Abdel-Wahab MS, et al. Bile pulmonary embolism-related sudden death following an abdominal firearm injury: an autopsy case report and review of literature. *Forensic Sci Med Pathol* 2021; 17: 493-497.
- Quinlan JD. Acute pancreatitis. *Am Fam Physician* 2014; 90: 632-639.
- Carroll JK, Herrick B, Gipson T, et al. Acute pancreatitis: diagnosis, prognosis, and treatment. *Am Fam Physician* 2007; 75: 1513-1520.
- American Gastroenterological Association (AGA) Institute on "Management of Acute Pancreatitis" Clinical Practice and Economics Committee; AGA Institute Governing Board. AGA Institute medical position statement on acute pancreatitis. *Gastroenterology* 2007; 132: 2019-2021.
- Doyle WF, Gray JM. Bile embolization following hepatic trauma. *Arch Pathol* 1968; 85: 559-561.
- Doerig M. Gallenembolie nach posttraumatischem Budd-Chiari-syndrom [Biliary embolism after posttraumatic Budd-Chiari syndrome]. *Helv Chir Acta* 1972; 39: 191-194.
- Pulmonary bile embolism. *Med Sci Law* 2013; 53: 122.
- Mehta S, Rubenstone AI. Pulmonary bile thromboemboli. A report of two cases. *Am J Clin Pathol* 1967; 47: 490-496.
- Vestfrid MA, Pianzola LE. Tromboembolismo biliar [Biliary thromboembolism]. *Rev Clin Esp* 1972; 125: 457-460.
- Morentin B, Aguilera B, Portugal V, et al. Embolismo pulmonar biliar no traumático fatal tras colecistitis litiásica [Non traumatic fatal bile pulmonary embolism following lithiasic cholecystitis]. *Rev Esp Enferm Dig* 2007; 99: 733-734.
- Lorenzo N, Restrepo JA, Aguilar R. Pulmonary embolism, where are the thrombi? *Eur J Intern Med* 2014; 25: e91-92.
- Koehler LS, Christides PS, Adamec TA. A complication of percutaneous cholangiography resulting in hypoxia and death of an anesthetized patient. *Anesthesiology* 1978; 49: 210-212.
- Brozinsky S, DeSoto-Lapaix F, Jimenez FA, et al. Bile emboli: a complication of PTD. *J Clin Gastroenterol* 1981; 3: 135-137.
- Armellin GM, Smith RC, Faithfull GR. Pulmonary bile emboli following percutaneous cholangiography and biliary drainage. *Pathology* 1981; 13: 615-618.
- Peven DR, Yokoo H. Bile pulmonary embolism: report of a case and a review of the literature. *Am J Gastroenterol* 1983; 78: 830-834.
- Balogh K. Pulmonary bile emboli. Sequelae of iatrogenic trauma. *Arch Pathol Lab Med* 1984; 108: 814-816.
- Decker R, Hofmann W, Buhr H. Galleembolie der Lunge nach intraoperativer Leberfeinnadelbiopsie. Fallbericht und Literaturübersicht [Bile embolism of the lung following intraoperative fine needle liver biopsy. Case report and review of the literature]. *Chirurg* 1985; 56: 666-669.
- Proia AD, Fetter BF, Woodard BH, et al. Fatal pulmonary bile embolism following acute acalculous cholecystitis. *Arch Surg* 1986; 121: 1206-1208.
- Helpap B, Knüppfer J, Jansen T. Akute akalkulöse (postoperative) Cholecystitis mit Galleembolie der Lunge [Acute acalculous (postoperative) cholecystitis with bile embolism of the lung]. *Chirurg* 1987; 58: 496-500.
- Kihira T, Konishi T, Shiraishi T, et al. Fatal bile pulmonary embolism following percutaneous transhepatic cholangiodrainage: case report and literature review. *Angiology* 1993; 44: 725-730.
- Schmidt-Mutter C, Breining T, Gangi A, et al. Fatal bile pulmonary embolism after radiofrequency treatment of a hepatocellular carcinoma. *Surg Endosc* 2003; 17: 2028-2031.
- Siddiqui J, Jaffe PE, Aziz K, et al. Fatal air and bile embolism after percutaneous liver biopsy and ERCP. *Gastrointest Endosc* 2005; 61: 153-157.
- Jusufović MS, Makridis G, Feyereabend B, et al. First report of a late lethal pulmonary biliary embolism following hepatic microwave ablation. *Visc Med* 2021; 37: 550-554.

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