

CASE REPORT

Subcutaneous Emphysema, Pneumomediastinum, Pneumoperitoneum, and Pneumoretroperitonium: Uncommon Complications of ERCP

Elias Makhoul, Bassem Akiki

Department of Gastroenterology, University Hospital Notre Dame de Secours, Byblos, Lebanon

ABSTRACT

Context Endoscopic retrograde cholangiopancreatography is a technique used to diagnose and treat certain problems of the biliary or pancreatic ductal systems. It is a safe procedure and serious complications are uncommon. Pneumomediastinum, pneumothorax, pneumoperitoneum and subcutaneous emphysema are rare complications after endoscopic retrograde cholangiopancreatography. **Case report** An Eighty-year-old woman hospitalized for lower respiratory tract infection was diagnosed with pneumomediastinum, pneumoperitoneum and subcutaneous emphysema after performing an endoscopic retrograde cholangiopancreatography during her hospital stay for increased pancreatic enzymes and dilated common bile duct. With the absence of a perforation site on imaging studies, a conservative treatment was established. The patient was discharged with a very good outcome clinically and radiographically. **Discussion** This article presents a review of the literature on this rare post endoscopic retrograde cholangiopancreatography complication especially the mechanisms of air leakage in the absence of a perforation site. **Conclusion** Pneumomediastinum, pneumothorax, pneumoperitoneum and subcutaneous emphysema are rare but serious complications after endoscopic retrograde cholangiopancreatography. Conservative treatment might be appropriate with the absence of a perforation site with a very good outcome.

INTRODUCTION

Endoscopic retrograde Cholangiopancreatography (ERCP) with sphincterotomy is a well-established technique for the diagnosis and treatment of pancreatic and extrahepatic biliary tract diseases. It is considered to be a safe procedure, however ERCP might have several complications. A rare case of pneumoperitoneum, pneumoretroperitonium, pneumomediastinum and subcutaneous emphysema related to this procedure is reported.

CASE REPORT

An Eighty-year-old woman, with a past surgical history of gastrectomy for peptic ulcer disease and cholecystectomy 40 and 13 years ago respectively, was admitted to our hospital because of a persisting low grade fever since one week prior to her admission.

She was diagnosed with a lower respiratory tract infection and was treated by levofloxacin. 4 days after her admission, she complained of an acute episode of

epigastric pain, a blood test including amylase, lipase and liver enzymes was done and showed an amylase level of 580U/L (reference range 0-100 U/L), a lipase level of 150 U/L (reference range 0-60 U/L) with a normal liver function test. An abdominal ultrasonography showed a dilatation of the common bile duct with biliary sludge without any mass of the pancreas. Computed tomography (CT) showed the same findings as well. So an ERCP with sphincterotomy was planned and done 2 days later. The procedure was successful after several attempts to locate the duodenal papilla that was technically difficult because of her surgical history of gastrectomy. Immediately after the procedure and for the rest of the day, there were no abnormal symptoms or signs. The next day, the patient was asymptomatic and hemodynamically stable, however the follow-up physical examination revealed crepitus in the soft tissues of the neck. Plain radiographs of the chest and abdomen revealed subcutaneous emphysema, pneumoperitoneum and pneumomediastinum. Abdominal and chest CT-scan showed no evidence of peritoneal or retroperitoneal perforation but air was noted in the peritoneal cavity, the mediastinum and in the soft tissues of the neck. Since the patient was asymptomatic, stable and in the absence of identifying a site of free perforation, a conservative treatment was adopted with broad-spectrum antibiotics and hydration. After 72 hours, the patient started to drink fluids and was on a very light diet. One week later, there was no evidence of subcutaneous emphysema on physical examination, and in the absence of radiographic signs of pneumomediastinum and pneumoperitoneum the patient was discharged (**Figures 1-3**).

Received July 15th, 2015-Accepted August 28th, 2015

Keywords Cholangiopancreatography, Endoscopic Retrograde; complications; Sphincterotomy, Endoscopic

Correspondence Elias Makhoul

Department of Gastroenterology, Faculty of Medicine and sciences Holy Spirit University

University Hospital Notre Dame De Secours Byblos

POB: 3 Byblos

Lebanon

Phone +961 3711787/9944480

Fax +961 9944483

E-mail eliemakhoul@hotmail.com/eliasmakhaoul@usek.edu.lb

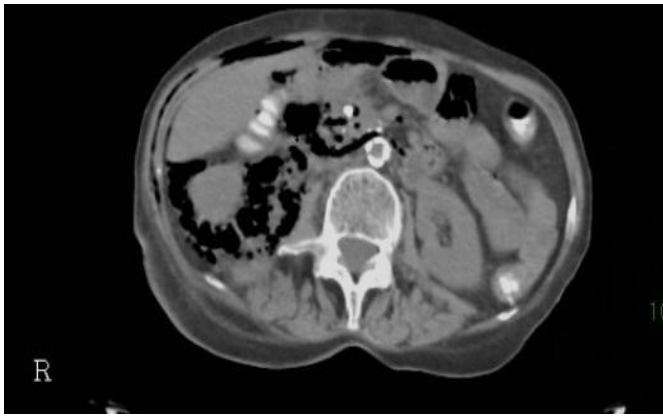


Figure 1. Pneumoperitoneum and retroperitoneum.



Figure 2. Pneumomediastinum and subcutaneous emphysema.

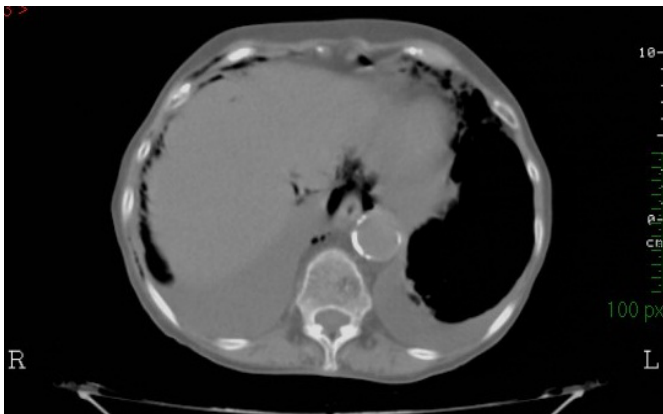


Figure 3. Periampullary air without signs of duodenal perforation.

DISCUSSION

The main risk factors for complication of ERCP are difficult bile duct cannulation, sphincter of oddi dysfunction, previous gastro-intestinal surgery and pre-cut technique [1]. Major complications of ERCP include hemorrhage, pancreatitis, cholangitis and duodenal perforation [2, 3].

Perforation is an uncommon complication which usually indicates free air in the peritoneal cavity or the retroperitoneal space. Air leakage from the retroperitoneum into the peritoneum, mediastinum, pleura, or subcutaneous tissue is a rare complication of ERCP and results in pneumoperitoneum, pneumomediastinum, pneumothorax, or subcutaneous emphysema, respectively [4-9].

The most common cause for air leakage during ERCP is duodenal perforation [10]; however, any site of low resistance like an ulcer or tumor may serve as a "release" valve during insufflations [11]. Three distinct types of ERCP-related perforations are described, guide wire-related perforations, periampullary perforations during sphincterotomy, or perforations that are remote from the papilla [1-3].

The explanation of pneumoperitoneum and retroperitoneum in the absence of duodenal perforation is the high pressure of compressed air in the lumen, creating a pressure valve from a site of low resistance such as the sphincterotomy, with leakage of air from the lumen into the intraperitoneal or retroperitoneal space.

One explanation is the anatomic route by which peritoneal air results in pneumomediastinum and pneumothoraces. The visceral space that inverts the esophagus and the trachea continues with these structures into the mediastinum. It follows the esophagus through the diaphragmatic hiatus into the peritoneal and retroperitoneal soft tissue space. This leads to continuity along the neck, thorax and abdomen. So, air arising in any one of these regions could reach another area by "traveling" along the fascial planes [12].

Another explanation, is the presence of porous diaphragm syndromes by categorizing the clinical occurrence of peritoneopleural transphrenic passage of fluids or gases through, either congenital or acquired pores in the diaphragm [5, 13].

Subcutaneous emphysema is an obvious physical sign but its etiology is complex to determine. It may be due to the emergence of a pressure gradient between the peritoneum and surrounding structures, allowing gas from a perforation to diffuse along tissue planes [14].

Pneumomediastinum without evidence of perforation has been described after sigmoidoscopy or colonoscopy, endoscopic sphincterotomy, esophagogastroscopy, contrast barium enema and endoscopic polypectomy. Also there are few reports for pneumothorax as a post-ERCP complication.

Subcutaneous emphysema of anterior abdomen wall is an obvious physical sign but its etiology is complex to determine and may be potentially lethal. The pathophysiological mechanism involved is the emergence of a pressure gradient between the peritoneum and surrounding structures, causing rupture of the anterior abdominal wall, allowing gas from a perforation to diffuse along tissue planes.

Retroperitoneal air can be discovered on a CT scan performed 24 hours after ERCP in up to 29% of asymptomatic patients, most probably related to air insufflations during endoscopy, suggesting that presence of retroperitoneal air in the absence of symptoms is not indicative of perforation. Only observation is required in such cases.

Ct scan, standard thorax and abdomen x ray are necessary for the diagnosis of these complications. Treatment depends on the type of injury and the patient's clinical symptoms. The indications for surgery include, lateral or medial duodenal wall perforations, peritoneal signs and sepsis, radiographic findings of retroperitoneal or peritoneal fluid on CT or large contrast extravasation on ERCP or upper GI series [10, 12, 15, 16, 17].

The initial management of peri-ampullary perforations is conservative. However 10–43% of patients may require surgical repair [10, 18].

In the absence of the above cited findings, the patient may be closely monitored and managed with intravenous hydration, broad-spectrum IV antibiotics, nothing by mouth. Once the patient shows clinical improvement, the diet may be initiated and slowly advanced [10, 15, 16, 17, 19, 20]. The prognosis depends on early recognition and treatment of the perforation, if it exists [10].

In conclusion, subcutaneous emphysema, pneumoperitoneum, pneumoretroperitonium pneumothorax and pneumomediastinum are uncommon and life threatening complications of ERCP. Mechanism is not well known. Outcome of early conservative treatment was very good. Surgery may be required only for the most compelling indications of fluid extravasation, peritonitis, or sepsis.

Conflict of Interest

The authors declare that they have no conflicts of interest

References

1. Freeman ML, Nelson DB, Sherman S, et al. Complications of endoscopic biliary sphincterotomy. *N Engl J Med* 1996; 335:909-918. [PMID: 8782497]
2. Silveira ML, Seamon MJ, Porshinsky B, Prosciak MP, Doraiswamy VA, Wang CF, Lorenzo M, et al. Complications related to endoscopic retrograde cholangiopancreatography: a comprehensive clinical review. *J Gastrointest Liver Dis* 2009; 18:73–82. [PMID: 19337638]
3. Mallery JS, Baron TH, Dominitz JA, Goldstein JL, Hirota WK, Jacobson BC, Leighton JA, et al. Complications of ERCP. *Gastrointest Endosc* 2003; 57:633-638. [PMID: 12709688]
4. Alexiou K, Sakellariadis T, Sikalias N, Karanikas I, Economou N, Antsaklis G. Subcutaneous emphysema, pneumomediastinum and pneumoperitoneum after unsuccessful ERCP: a case report. *Cases J* 2009; 2:120. [PMID: 19192290]
5. Kirschner PA. Porous diaphragm syndromes. *Chest Surg Clin N Am* 1998; 8:449-472. [PMID: 9619316]
6. Ferrara F, Luigiano C, Billi P, Jovine E, Cinquantini F, D'Imperio N. Pneumothorax, pneumomediastinum, pneumoperitoneum, pneumoretroperitoneum, and subcutaneous emphysema after ERCP. *Gastrointest Endosc* 2009; 69:1398-401. [PMID: 19152899]
7. Ozgonul A, Cece H, Sogut O, Demir D, Kurkcuoglu S. Pneumoperitoneum, pneumoretroperitoneum and bilateral pneumothorax caused by ERCP. *ICJ Pak Med Assoc* 2010; 60:60-1. [PMID: 20055284]
8. Sampaziotis F, Wiles A, Shaikat S, Dickinson RJ. Bilateral pneumothorax and subcutaneous emphysema following endoscopic retrograde cholangiopancreatography: a rare complication. *Diagn Ther Endosc*. 2010; 894045. [PMID: 20827432]
9. Schiavon LL. Subcutaneous emphysema, pneumothorax, and pneumomediastinum following endoscopic sphincterotomy. *Gastroenterol Res* 2010; 3:216–218.
10. Stapfer M, Selby RR, Stain SC, et al. Management of duodenal perforation after endoscopic retrograde cholangiopancreatography and sphincterotomy. *Ann Surg*. 2000; 232:191–198. [PMID: 10903596]
11. Mosler P, Fogel EL. Massive subcutaneous emphysema after attempted endoscopic retrograde cholangiopancreatography in a patient with a history of bariatric gastric bypass surgery. *Endoscopy*. 2007; 39 Suppl 1:E155. [PMID: 16673301]
12. Maunder RJ, Pierson DJ, Hudson LD: Subcutaneous and mediastinal emphysema, pathophysiology, diagnosis and management. *Arch Intern Med* 1984, 144:1447-1453. [PMID: 6375617]
13. Kokaman O, Sipi M, Çubukçu A, Baykara ZN, Hulagu S. Porous diaphragm syndrome after ERCP in a patient with bile duct stricture. *The Turkish Journal of Gastroenterology* 2009; 20:157-158. [PMID: 19530056]
14. Kassir R, Abboud R, Dubois K, Baccot J, Debs S, Favre T, Gugenheim JP, Gastaldi J, et al. Perforated diverticulitis of the sigmoid colon causing a subcutaneous emphysema. *Int J Surg Case Rep* 2014; 5:1190-2. [PMID: 25437673]
15. Ciaccia D, Branch MS, Baillie J. Pneumomediastinum after endoscopic sphincterotomy. *Am J Gastroenterol* 1995; 90:475-477. [PMID: 7872289]
16. Fujii L, Lau A, Fleischer DE, Harrison ME. Successful nonsurgical treatment of pneumomediastinum, pneumothorax, pneumoperitoneum, pneumoretroperitoneum, and subcutaneous emphysema following ERCP. *Gastroenterol Res Pract* 2010; 2010:289135.
17. Howard TJ, Tan T, Lehman GA, Sherman S, Madura JA, Fogel E, Swack ML, Kopecky KK. Classification and management of perforations complicating endoscopic sphincterotomy. *Surgery* 1999; 126:658–663; discussion 664–665. [PMID: 10520912]
18. Kim JH, Yoo BM, Kim JH, Kim MW, Kim WH. Management of ERCP-related perforations: outcomes of single institution in Korea. *J Gastrointest Surg* 2009; 13:728–734. [PMID: 19130154]
19. Wu HM, Dixon E, May GR, Sutherland FR. Management of perforation after endoscopic retrograde cholangiopancreatography (ERCP): a population-based review. *HPB (Oxford)* 2006; 8:393–399. [PMCID: PMC2020744]
20. Assalia A, Suissa A, Ilivitzki A, Mahajna A, Yassin K, Hashmonai M, Krausz MM. Validity of clinical criteria in the management of endoscopic retrograde cholangiopancreatography-related duodenal perforations. *Archives of Surgery* 2007; 142:1059–1064. [PMID: 18025334]