



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<http://doi.org/10.5281/zenodo.4274079>Available online at: <http://www.iajps.com>

Research Article

**DEVELOPMENT OF PNEUMOMEDIASTINUM,
PNEUMOPERITONEUM, PNEUMORETROPERITONEUM,
AND SURGICAL EMPHYSEMA FOLLOWING ERCP.****¹Tehreem Fatima, ²Hassan Mumtaz, ³Fatima Meer, ⁴Ahsan Shafiq, ⁵Mirza muhammad haider abbas, ⁶Nusrat Jahan**

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Article Received: September 2020 **Accepted:** October 2020 **Published:** November 2020**Abstract:**

Endoscopic retrograde cholangiopancreatography (ERCP) is a non-invasive procedure used in contemporary gastrointestinal practice, where in many cases it is lifesaving. But this procedure can also result in complications like; pancreatitis, sepsis, bleeding, and perforation. Here we discuss an unusual case where the patient underwent an urgent ERCP due to choledocholithiasis but the procedure was stopped due to suspicion of iatrogenic injury. On the second postoperative day, the patient developed Pneumomediastinum, Pneumoperitoneum, Pneumoretroperitoneum, and Surgical Emphysema. In spite of these serious complications, the patient was successfully managed with conservative treatment.

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Please cite this article in press Tehreem Fatima et al, *Development Of Pneumomediastinum, Pneumoperitoneum, Pneumoretroperitoneum, And Surgical Emphysema Following Ercp.*, Indo Am. J. P. Sci, 2020; 07(11).

INTRODUCTION:

Endoscopic retrograde cholangiopancreatography (ERCP) is a combined endoscopic and fluoroscopic procedure in which an upper endoscope is taken into the second part of the duodenum to perform minimally invasive procedures. These procedures include; stent placement in patients with strictures, fistulae, and leaks to stone removal in the case of choledocholithiasis [1]. ERCP use in choledocholithiasis is of utmost importance. It is a well-established method for treating recurrent or retained common bile duct stones. The rate of specific complications that include pancreatitis, sepsis, bleeding, and perforation—reportedly ranges from 5 to 6.9 %, with a mortality rate of 0.33 % [2]. One of the most feared complications is perforation [3], which can result in the occurrence of free air in the peritoneal cavity, mediastinum, and subcutaneous tissue leading to pneumoperitoneum, pneumoretroperitoneum, pneumomediastinum, pneumothorax, and surgical emphysema. Here we describe a patient with post-

ERCP surgical emphysema, pneumomediastinum, pneumoperitoneum, and pneumoretroperitoneum who got better with conservative management.

CASE PRESENTATION:

A 32-year-old male, with no premorbid, presented to surgical E.R with complaints of abdominal pain, jaundice, and fever for five days. The abdominal pain was located in the epigastric region. It was sudden in onset, severe in intensity, continuous, and radiating to back. The pain was associated with 3-4 episodes of vomiting which were non-bilious and non-projectile. High grade-fever with rigors and chills was also reported. The patient developed jaundice but there was no history of dark urine or clay-colored stools.

On examination, the abdomen was soft with mild tenderness noted in the epigastrium. The chest was clear bilaterally. Cardiac and CNS examinations were also normal.

Basic lab investigations are mentioned in Table 1.

	Patient Values	Normal Values
ALT (IU/L)	193	19-25
AST (IU/L)	139	7-56
ALP (IU/L)	373	44-147
GGT (IU/L)	649	0-30
LDH (IU/L)	501	105-333
TLC ($\times 10^9/L$)	14.4	4.5-11.0
Hb (g/dL)	13	12-16
Platlets ($\times 10^9/L$)	322	150-400
Total Bilirubin mg/dl)	2.0	0.1-1.2

Ultrasound revealed cholelithiasis. MRCP showed a filling defect in distal CBD and was suggestive of choledocholithiasis. So, the patient underwent urgent ERCP with the removal of two stones but the procedure was halted because of suspicion of iatrogenic injury. On the second postoperative day, the patient described a sensation of crackling in the chest and abdomen. On examination, the patient was stable but febrile with low-grade fever and had subcutaneous crepitation on the right side of the lower chest and the

left upper abdomen. CT scan revealed pneumomediastinum, pneumoperitoneum (figure 1), and pneumoretroperitoneum (figure 2) raising suspicion of perforation of the second part of the duodenum.

The patient was managed conservatively. Jaundice and surgical emphysema were resolved and Labs reports revealed improved Liver Function Tests.



DISCUSSION:

Some patients may have increased risks for perforation. The risk of duodenal perforation is increased in patients with upper gastrointestinal or bile duct stenosis, greater age, and patients with surgically altered anatomy. Procedure-related risks include the performance of sphincterotomy and longer duration of the procedure [4]. However, none of these risk factors were found in our patient. According to Prachayakul V, in the case of surgically altered anatomy, it is very important to assess with an end-view gastroscope first before the procedure. Furthermore, in the case of an anatomic stricture duodenoscope should be inserted in an “over-the-guidewire” fashion to minimize duodenal wall injury [5].

A couple of studies have presented theories for how Duodenal perforation leads to surgical emphysema, pneumothorax, tension pneumothorax, pneumomediastinum, pneumoperitoneum, and pneumoretroperitoneum. One hypothesis is that duodenal perforation gives rise to retroperitoneal air collection, which via pores in the diaphragm allows air to move into the thorax and then into subcutaneous tissues, thus causing subcutaneous emphysema. Another theory propounds that trauma to the duodenal wall allows air to enter the mucosa, that advance along the perineural and perivascular sheaths into the mediastinum [2]. Additionally, deep cervical fascia surrounds the trachea and esophagus and is continuous with diaphragmatic/esophageal hiatus, hilar vessel interstitium, and major airways of the thorax. As a result, this space allows movement of air to take place from the retroperitoneum to mediastinum and then into the subcutaneous tissue around the neck which then track down along the endothoracic fascia of the chest wall to the transversalis fascia of the abdomen to cause surgical emphysema on the abdomen as seen in our patient [3]. Our patient developed surgical emphysema on the right lower chest and left upper

abdomen on 2nd POD day along with low-grade fever and cough. CT scan revealed raising suspicion of perforation of the second part of the duodenum.

A study has demonstrated that Pneumothorax is a frequent finding in ERCP-related perforation. Pneumothorax is usually right-sided (55%) or bilateral (40%) and accompanied by pneumomediastinum, pneumoperitoneum, and subcutaneous emphysema [6]. Interestingly, our patient did not develop a pneumothorax, but only pneumoperitoneum, pneumoretroperitoneum and pneumomediastinum, and subcutaneous emphysema. It was observed in a study that retroperitoneal air can occur post-ERCP even in the absence of perforation. It may be caused by the insufflation of pressurized air that is used to maintain the patency of the gastrointestinal or biliary lumen. This air then spread through fascial planes to subcutaneous tissue leading to subcutaneous emphysema, or diffuse to the peritoneal cavity, causing pneumoperitoneum, or even escape through tiny communications between the pleural space and the peritoneum, causing pneumothorax or pneumomediastinum [7].

Most cases of pneumothorax, pneumoretroperitoneum, and retroperitoneum are conservatively managed with antibiotics, fasting, and chest tube drainage when indicated. Fatal outcomes have been related to delayed diagnosis and tension pneumothorax. Early recognition of this condition and prompt management is essential to improve the outcome [6]. In our case, the patient was diagnosed timely and conservatively managed. Fortunately, our patient did not develop any complications.

CONCLUSION:

ERCP-related perforations are a serious complication with a high mortality rate. So it's very important to evaluate for any risks before ERCP and to perform the

procedure with utmost caution. After the procedure, the patient should be counseled to report any abdominal symptom and the ward staff should also be notified to closely observe patients with difficult cases for the detection of any possible complications as early as possible. Furthermore, It should also be remembered that air collections can be a part of this high pressurized procedure, and can occur in the absence of perforation. In any case, treatment is mostly non-surgical unless gastrointestinal or biliary tract perforation is established.

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