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## R gas under diaphragm



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## ABSTRACT

**INTRODUCTION:** The most common cause of gas under diaphragm is hollow viscous perforation. In 10% of cases it can be due to rare causes, both abdominal and extra-abdominal, one of them being intra abdominal infection by gas forming organisms.

**PRESENTATION OF THE CASE:** A 51 year old male patient, a poorly controlled diabetic, presented with a second episode of severe pain abdomen and abdominal distention, with lower abdominal tenderness. Plain Xray of the abdomen in erect posture showed gas under the right dome of diaphragm and ultrasound abdomen confirmed gross pneumoperitoneum. On emergency laparotomy, a pancreatic abscess was discovered, which had ruptured through the inferior leaf of the transverse mesocolon.

**DISCUSSION:** There are many obscure causes for extra-intestinal and extra abdominal sources for gas under diaphragm which contribute to 10% of the etiology for the same. These are as follows: post laparotomy status, ruptured liver abscess, retroperitoneal air, biliary-enteric fistula, gall stone ileus, incompetent sphincter of Oddi, focal biliary lipomatosis, post scuba diving, post adeno-tonsillectomy, post dental extraction, following arthroscopy of the knee, intra abdominal sepsis by gas forming organisms and pneumatosis coli to name a few.

In this case, Klebsiella was responsible for producing gas under the diaphragm.

**CONCLUSION:** Pancreatic abscess, in particular, as a extraintestinal source for gas under diaphragm has not been reported in English literature.

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## 1. Introduction

The term pneumo-peritoneum is used to describe the presence of free gas within the peritoneal cavity. In 90% of cases, it is the result of hollow viscus perforation. Patients with pneumo-peritoneum with no positive abdominal findings are classified as having spontaneous or non-surgical pneumo-peritoneum [1]. Detection of this entity helps in avoiding negative laparotomy.

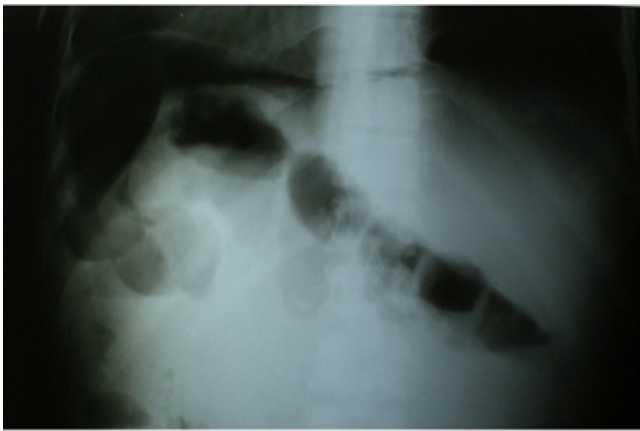
## 2. Material and methods

A 51 year old male, presented with complaints severe abdominal pain of three days duration, mild abdominal distention and fever since one day. There was No history of radiation of pain to the back. He had complaints of pain abdomen of moderate intensity in the periumbilical region three weeks ago, and was diagnosed to have subacute intestinal obstruction based on multiple air fluid levels on an erect abdominal Xray and was managed conservatively. During

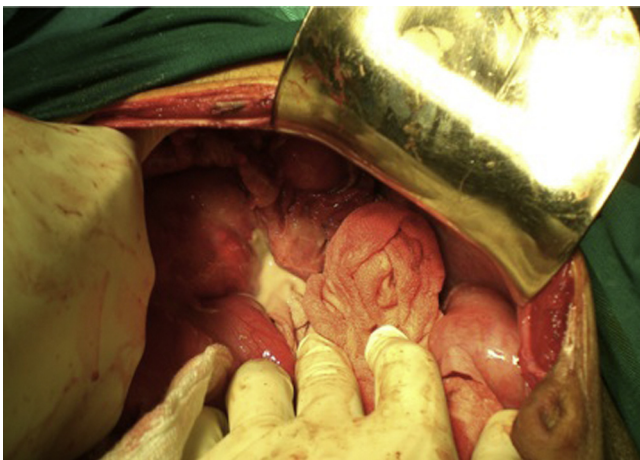
the initial episode of pain abdomen, serum amylase and lipase done was found to be normal. He was a known diabetic on irregular treatment. Presently, On examination, patient was in distress, febrile, with a pulse rate of 130/min, blood pressure of 100/70 mm Hg and a respiratory rate of 24/min. Abdomen was mildly distended, soft to palpate, with tenderness present over the lower abdomen. Bowel sounds were absent. Rectal examination was normal. Investigations done were as follows: Hemoglobin 11gm/dl; total white cell count 5500/cc; neutrophils 54%; lymphocytes 40%. Liver function tests were normal. X-ray abdomen in erect posture showed gas shadow under right dome of diaphragm (Fig. 1). Emergency bedside abdominal ultrasound was done immediately to look for possible cause of free intraperitoneal air which revealed gross pneumo-peritoneum obscuring the upper abdominal viscera. There was minimal ascites with bowel and mesenteric wall thickening. A provisional diagnosis of intestinal perforation was made. A CT of the abdomen would have been ideal, but due to financial constraints and paucity of time, it was deferred. Patient underwent emergency laparotomy. The operative findings were as follows: thick purulent fluid was found coming through the inferior leaf of transverse mesocolon to left of the duodeno-jejunal flexure with no perforation of hollow viscera (Fig. 2). An inflammatory mass was found in the lesser sac, arising from body and tail of pancreas, which was discharged

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**Fig. 1.** X-ray abdomen in erect posture showed gas shadow under right dome of diaphragm.



**Fig. 2.** Pus in inferior leaf of transverse mesocolon.

ing yellow pus. The pancreatic abscess was debrided and drained outside using two suction drains kept supero-inferiorly. Post operatively, irrigation and drainage was performed through these tubes using copious amounts of normal saline. Post operative period was uneventful. The pus grew *Klebsiella* sensitive to aminoglycosides. Histopathology of tissue sent showed necrotic pancreatic tissue.

### 3. Discussion

The following differential diagnoses are considered in a patient found to have air under the diaphragm in an erect chest X-ray or an erect abdominal x-ray: hollow viscus perforation (90%), pneumato-sis coli, post laparotomy, vaginal insufflation for tubal patency test, overlying bowel gas (Chilaiditi syndrome), ruptured liver abscess, retroperitoneal air, entero-biliary fistula, gall stone ileus, incompetent sphincter of oddi, focal biliary lipomatosis, scuba diving, post adeno-tonsillectomy, post dental extraction, following arthroscopy of the knee and intra abdominal sepsis by gas forming organisms to name a few [1].

In this case, *Klebsiella* was grown in the pus culture taken from the pancreatic abscess. *Klebsiella* is a common gas forming organism. The other organisms producing gas are *Escherichia coli*, *Clostridium*, *Staphylococcus*, *Streptococcus*, *Candida* and *Pseudomonas* [2]. Bacteria were found to get their energy via fermentation of glucose through various pathways. The mixed acid fermentation is the preferred pathway of glucose metabolism in bacteria like *Klebsiella* belonging to species of *Enterobacteriaceae*.

This type of fermentation often leads to accumulation of acids, and when the pH reaches 6 or less, microorganisms will produce formic hydrogenylase, which converts formic acid to carbon dioxide and hydrogen. In diabetics, the high level of blood glucose provides the ideal environment for the bacteria to form gas via the above-described mechanism. Also, the high levels of glucose in tissue and the compromised immunity in diabetics provide microbes with a microenvironment favorable for continued multiplication and energetic metabolism. Local tissue damage caused by the bacteria, compounded by the diabetic micro-angiopathy markedly retards the transport of catabolic end products away from the site of abscess there by resulting in gas accumulation [3].

An x-ray of the abdomen or chest x-ray, in erect posture detects free air in the peritoneal cavity in 60–70% of cases of peritonitis. Ultrasound is better with a sensitivity of 85–100% and high specificity (84–100%).

In an analysis done on 185 patients with peptic ulcer perforation, Tawfiq. J Mohammad illustrated that ultrasound was able to detect free gas or free fluid in 25% of patients with normal erect abdominal/chest x-ray and in 96.9% with CT scan [4]. CT scan of the abdomen can detect even a small amount of air as small as 5cc, free fluid and even the site of perforation. It should be considered the gold standard investigation for detecting free gas in the peritoneal cavity [4–6].

CT scan is the investigation of choice showing intra-pancreatic gas as well as gas within the portal vein. In the index case a CT scan of the abdomen was not done due to financial constraints of the patient.

Pancreatic abscess is one of the infectious complications of acute pancreatitis. It is a collection principally containing pus, but it may also contain variable amounts of semisolid necrotic debris. Most of these abscesses evolve from the progressive liquefaction of necrotic pancreatic and peripancreatic tissues, but some arise from infection of peripancreatic fluid or collections elsewhere in the peritoneal cavity. Incidence varies from 5 to 9% of all patients with acute pancreatitis [7]. Immunocompromised individuals and those with chronic renal failure have a higher chance of developing pancreatic abscess following an episode of acute pancreatitis [8]. Although open surgical treatment of infected necrosis is the established treatment of choice, percutaneous and minimally invasive approach to drainage of pancreatic abscess has also been found to be successful

### 4. Conclusion

Pancreatic abscess specifically presenting as an extraintestinal source for gas under diaphragm has never been reported in English literature.

### Conflict of interest

Dr Sreevathsa MR and Dr Khyati Melanta declare that they have no conflict of interest.

### Funding

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### Ethical approval

Not applicable.

### Consent

Informed consent of patient for publishing case details and images have been taken.

**Author contributions**

Dr Sreevathsa M.R: Design, data collection, writing the paper, analysis.

Dr Khyati Melanta: data collection, writing.

**Guarantor**

Dr M.R. Sreevathsa.

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