

Pneumoperitoneum or Chilaiditi's sign

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Abstract

Chilaiditi's sign describes the incidental radiographic finding of the bowel positioned between the right diaphragm and the liver. This is often misdiagnosed as pneumoperitoneum or free air under the diaphragm, which may lead to unnecessary investigations or surgical procedures. Here, we report two incidental chest radiograph findings of air under the diaphragm in patients who were being screened for pulmonary tuberculosis. This case series highlights the importance of awareness of the diagnosis of Chilaiditi's sign to avoid unnecessary hospital referrals.

Introduction

The presence of air under the diaphragm is a surgical emergency until proven otherwise. However, Chilaiditi's sign is a rare exception. It describes the incidental radiographic finding of the bowel positioned between the right diaphragm and the liver. This is often misdiagnosed as pneumoperitoneum or free air under the diaphragm. The incidence of Chilaiditi's sign is 0.025%–0.28% globally.¹ It was first reported by Demetrius Chilaiditi, a radiologist, in 1910.² There have been two reported cases of Chilaiditi's sign in Malaysia to date.³ In a primary care setting, clinical assessment can avoid unnecessary worry and referral, as this condition can be managed conservatively in asymptomatic patients.

Case report

Case 1

Ms. MAL, a 43-year-old Chinese woman, presented to a primary care clinic with cough and loss of appetite for 2 weeks. There was no weight loss, night sweat, haemoptysis or abdominal pain. MAL has Down syndrome and, according to her mother, only had a few minor ailments previously.

Physical examination results were normal. Her lungs were clear, and the abdomen was soft.

MAL was screened for pulmonary tuberculosis (PTB), for which a chest radiograph was performed (Figure 1). A large collection of air was found under the diaphragm on both

sides, and the attending doctor suspected pneumoperitoneum. However, MAL was clinically well and did not exhibit any signs or symptoms of perforation. A radiologist was consulted regarding the abnormal radiological finding. The chest radiograph observation was reported as bilateral diaphragmatic interposition of the colon and diagnosed as Chilaiditi's sign. Other investigations for PTB yielded normal results, and the patient recovered after being treated for upper respiratory tract infection.

Case 2

Mr. TSF, a 78-year-old Chinese man, had productive cough with whitish phlegm for the past 3 weeks. He had PTB in his young age and had completed treatment. He was also undergoing treatment for hypertension and Parkinson disease, both of which were well controlled.

Physical examination results were normal. His lungs were clear, and the abdomen was soft and not distended.

Chest radiography was performed to exclude reactivation of PTB. It showed an old fibrotic scar at the right apex, with trachea deviation to the right and opacity at the left apex (Figure 2). A collection of air was noted separating the diaphragm and the liver at the right hypochondrium. The chest radiograph observation was reported as Chilaiditi's sign along with old PTB. Three different samples of sputum were analysed, which were negative for acid-fast bacilli. The patient responded to symptomatic treatment.

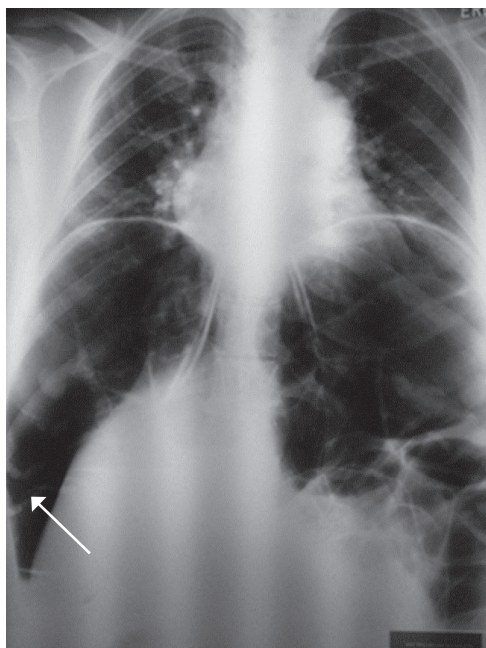


Figure 1. Chest radiograph of MAL showed diaphragmatic interposition of the colon. Note the haustra of the colon (*arrow*)

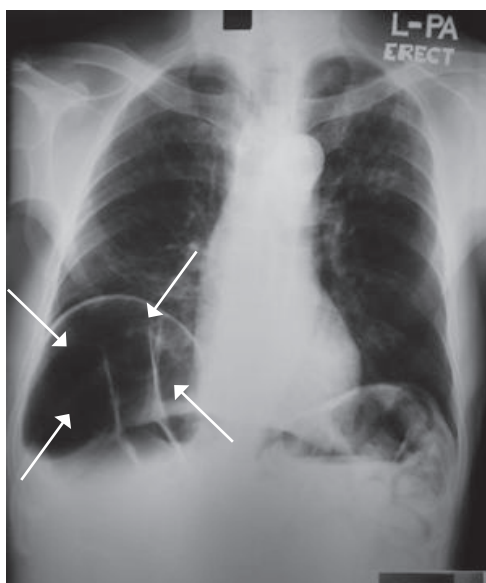


Figure 2. Chest radiograph of TSF showing the right hemidiaphragm (*arrows*) along with a distended colon and with air separating the diaphragm and the liver. Note the haustra of the colon (*arrow heads*)

Discussion

Chilaiditi's sign usually presents to the primary care practitioner as an incidental radiological finding as a result of investigations done for other diseases.⁴ To differentiate Chilaiditi's sign from other differential diagnosis, three main elements that contribute to the presentation of the disease must be considered: the intestine,

the liver, and the diaphragm.⁵ There are three essential radiological characteristics to confirm the diagnosis.⁶ First, the interposition must be significant enough to elevate the right hemidiaphragm. Second, the interposed colon (as seen by the haustral markings) must be distended with air and must lie between the diaphragm and the liver. Last, the liver must be displaced low enough that its upper margin lies lower than the left side of the diaphragm. These observations collectively are known as Chilaiditi's sign.⁶ Both our patients fulfilled all the aforementioned criteria. If there is any doubt regarding the radiological findings, other differential diagnoses should be seriously considered. Pneumoperitoneum or free air under the diaphragm is most often caused by visceral perforation, which is a surgical emergency. Only 10% of the pneumoperitoneum cases are not surgical.⁷ Other differential diagnoses not to be missed are perforated peptic ulcer disease, volvulus, intussusception, ischaemic bowel, and inflammatory conditions.⁵

History and physical examination play an important role in differentiating Chilaiditi sign from pneumoperitoneum. Patients who are asymptomatic and haemodynamically stable are likely to have Chilaiditi's sign.

The exact cause of Chilaiditi's sign is not clear, although a associations with schizophrenia and mental retardation, elderly male patients, obesity, chronic constipation, liver cirrhosis, chronic lung disease and multiple pregnancies have been reported.^{5,6} Anatomical distortions involving the liver, diaphragm, and intestine arising from these disorders or congenital variations predisposed to the condition.

Although, according to the available literature, other imaging methods to confirm the diagnosis of Chilaiditi syndrome include the opaque enema technique and chest/abdominal computed tomography,⁸ the availability of these resources in a primary care setting is limited.⁹ In such a setting, the alternative is to repeat the abdominal radiograph with the patient in the left lateral decubitus position when the equipment required to perform this is available.⁵ A change in the air location would indicate pneumoperitoneum and exclude Chilaiditi's sign.

Patients with Chilaiditi's sign are usually asymptomatic, but some cases may present

as Chilaiditi syndrome, a condition in which Chilaiditi's sign is accompanied by clinical symptoms. These symptoms can range from mild abdominal pain to acute bowel obstruction. The treatment for asymptomatic Chilaiditi's sign is generally conservative, which includes weight loss and change in decubitus position. For Chilaiditi syndrome, referral to a surgeon is mandatory if the patient has signs and symptoms of intestinal obstruction. Symptoms usually require hospital admission, although conservative management with bowel decompression and follow-up radiography is usually successful.⁵ Surgical intervention would be the only option of treatment if the aforementioned options fail.

Conclusion

A radiographic finding of air under the diaphragm warrants careful history taking and

physical investigation. Possible life-threatening emergencies must be excluded before the diagnosis of Chilaiditi's sign is made. Accurate diagnosis of Chilaiditi's sign in asymptomatic patient in primary care prevents unnecessary referrals or procedures.

Conflict of interest

None.

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