

## CASE REPORT

# Chilaiditi's sign: A rare differential diagnosis of pneumoperitoneum

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## Abstract

Chilaiditi sign is a rare condition typically mistaken for pneumoperitoneum. CT scan can confirm the diagnosis. Its management is conservative that is why it should be well known by surgeons to avoid unnecessary exploratory laparotomies.

## KEYWORDS

Chilaiditi sign, emergency, hepatodiaphragmatic interposition

## 1 | INTRODUCTION

Chilaiditi sign is a rare anomaly defined as the interposition of the small or large intestine between the liver and the right diaphragm.<sup>1</sup> This radiological finding was first described in the literature in 1910 by Demetrius Chilaiditi.<sup>2</sup> It is generally asymptomatic and incidentally found on chest or abdominal radiographs with a reported incidence ranging from 0.025% to 0.28%.<sup>3</sup> Commonly, this sign involves males with a male to female ratio of 4:1 and occurs more frequently in individuals aged above 60 years.<sup>4</sup> The symptomatic presentation of such a condition is known as Chilaiditi's syndrome.<sup>5</sup> Numerous symptoms may be seen including abdominal pain, respiratory distress, constipation, nausea, vomiting, and anorexia.<sup>6</sup>

Moreover, this syndrome can be life-threatening since it can lead to some severe complications such as intestinal volvulus, bowel ischemia, perforation, and obstruction.<sup>5</sup> Chilaiditi sign is typically mistaken for pneumoperitoneum. CT scan can confirm the diagnosis. The management is most of the time conservative. Even rare this abnormality should be well known by surgeons to avoid unnecessary exploratory laparotomies.<sup>7</sup>

## 2 | PRESENTATION OF CASE

A 32-year-old man, without significant past medical history, presented to the emergency department for blunt trauma to the thorax and abdomen following a road traffic accident (car crash). The patient was complaining of right chest and right upper quadrant abdominal pain.

On initial examination, he was in a hemodynamically stable condition (blood pressure 120/80 mm Hg, heart rate 80 beats/min) with a normal oxygen saturation of 99% on room air. His cardiovascular and respiratory examinations were unremarkable except for a right-sided posterolateral chest wall tenderness, upon palpation. The abdomen was soft, non-distended, and mildly tender in the right upper quadrant, without abdominal guarding. His extremity examination did not show any abnormality.

The chest X-ray demonstrated a gaseous image under right hemidiaphragm, suggesting the presence of pneumoperitoneum. However, it did not show any rib fractures, pneumothorax, or hemothorax (Figure 1). As these findings were in contrast with the clinical examination of the patient, further imaging by CT scan of the chest, abdomen, and pelvis was performed. The latter revealed interposition of the colon



**FIGURE 1** Chest x-ray showing air under right hemidiaphragm

loops between the liver and the diaphragm mimicking free air (Figure 2). Chilaiditi's sign was then identified. Furthermore, there were no thoracic or abdominal post-traumatic lesions.

The patient was treated with oral analgesics and discharged to his home 24 hours later.

### 3 | DISCUSSION

Chilaiditi sign, also known as a form of pseudo-pneumoperitoneum, is a rare intestinal disease and refers to the transposition of the colon or small bowel between the liver and diaphragm.<sup>1</sup>

The Greek radiologist Demetrius Chilaiditi was the first to report three cases of this radiologic finding, in 1910. Hence, the sign became known as Chilaiditi sign.<sup>2</sup> Commonly, the interposed bowels are the hepatic flexure and the colon or the proximal transverse colon, while the small bowel is rarely involved.<sup>8</sup>

The etiology of Chilaiditi's sign is not fully understood, and only few information is available in the literature about

its pathogenesis. It is reported that this sign may be secondary to congenital or acquired causes. Congenital ones include laxity or congenital absence of the hepatic suspensory ligaments, colonic redundancy, and paralysis of the right diaphragm.<sup>9</sup> The acquired risk factors of Chilaiditi's sign include liver atrophy secondary to cirrhosis, ascites, obesity, and chronic constipation.<sup>9</sup> This rare condition occurs four times more frequently in males than in females.<sup>4</sup>

Chilaiditi's sign is only an incidental radiographic finding and is usually asymptomatic. Conversely, when clinical symptoms accompany, it will be named Chilaiditi syndrome.<sup>5</sup> The majority of the patients presenting with Chilaiditi's syndrome develop gastrointestinal signs such as abdominal pain, nausea, vomiting, and constipation. Less frequently, they may develop respiratory distress or retrosternal chest pain.<sup>7</sup>

In addition to these clinical symptoms, Chilaiditi's syndrome can manifest itself with severe complications like volvulus of the cecum or transverse colon and cecal perforation.<sup>5</sup>

The diagnosis of this disease is challenging on plain chest X-ray since it cannot determine whether subdiaphragmatic air is free (pneumoperitoneum) or intraluminal.<sup>10</sup> Some authors suggest lateral views to visualize haustrations of the colon better. Also, left lateral decubitus views can be helpful. Unlike pneumoperitoneum, free air will remain in the subphrenic space in case of Chilaiditi's syndrome.<sup>11</sup> Nevertheless, Computed tomography scan remains the imaging modality of choice for accurate diagnosis.<sup>10</sup> As in our case, this investigation is of paramount importance in trauma patients without signs of peritoneal irritation on physical examination since it can rule out pneumoperitoneum and thus avoid an unnecessary emergent laparotomy.

Chilaiditi's sign does not require any treatment. Mildly symptomatic patients can be managed conservatively with bed rest, intravenous fluids, nasogastric decompression, enemas, high fiber diet, and stool softeners.<sup>4</sup>

Surgical treatment is indicated in the complicated forms of the disease, or when symptoms do not resolve with conservative management.<sup>12</sup> Surgical options range from pexy to colonic resection. Currently, there is no clear consensus on the best surgical approach to correct bowel interposition. Cecopexy is generally recommended for an uncomplicated cecal volvulus and is considered to be a low risk, and effective procedure for preventing further colonic dislocations. However, colonic resection is indicated in transverse colon volvulus and in cases of perforation and gangrene.<sup>1</sup>

Here, we report a case of an asymptomatic Chilaiditi's sign incidentally found on a chest radiograph in blunt chest and abdominal trauma patient that was treated conservatively.

Acute colonic pseudo-obstruction, also known as Ogilvie's syndrome, is an important differential diagnosis to be aware when diagnosing Chilaiditi's syndrome since many similar non-specific gastrointestinal disturbances are observed in both syndromes, including anorexia, abdominal pain,



**FIGURE 2** Axial CT view showing loops of colon interpositioned between the liver and right hemidiaphragm

vomiting, bowel distension, air-fluid levels, and constipation.<sup>13</sup> These two entities may even share the same radiologic features. When Chilaiditi's sign presents with Ogilvie's syndrome, it is managed with correcting the predisposing factors worsening colonic pseudo-obstruction such as electrolyte disturbances and anticholinergic medications. Treatment options include administration of neostigmine or radiological decompression.<sup>14</sup>

## 4 | CONCLUSION

Typically, in trauma surgery, the presence of « pneumoperitoneum » on the initial chest radiograph indicates immediate laparotomy. This case highlights the importance of clinical examination of injured patients. In case of doubt, further investigations should be performed, and surgery should be delayed. Surgeons should consider Chilaiditi sign, in all patients with air under right sub diaphragm and who do not show signs of peritonitis to avoid useless surgery.

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## CONFLICT OF INTEREST

None declared.

## AUTHOR'S CONTRIBUTIONS

Dr BII: wrote the manuscript and studied the concepts. Dr ZH: helped in data interpretation and manuscript evaluation. Dr RS: involved in data acquisition. Dr ZA: critically revised the manuscript.

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