Intern Emerg Med (2016) 11:1021–1022
DOI 10.1007/s11739-015-1364-8

CE - MEDICAL ILLUSTRATION

# Incidental finding of Chilaiditi's sign in an elderly individual with sarcopenia

**Karen K. Leung[1,3] · Bryan Frobb[2] · S. Mim Fatmi[2] · Bradley Martin[3] · Marc Saint-Martin[1,3]**

Received: 18 November 2015 / Accepted: 24 November 2015 / Published online: 8 December 2015


An 82-year-old was admitted to our geriatrics service for undernutrition with sarcopenia and failure to thrive. He required intensive rehabilitation to enable safe return home. On admission to hospital, he was hemodynamically stable with an oxygen saturation of 97 % on room air, and was in no apparent distress. His weight was 46.5 kg, which corresponded to a body mass index (BMI) of 16.8 kg/m$^2$. Our patient's medical history was significant only for remote bilateral femoral herniorrhaphy, developmental dysplasia of the right acetabulum, and benign prostatic hypertrophy. There were no constitutional symptoms or features concerning for a malignancy to account for his weight loss, but he had a poor oral intake in the prior 6 months. He had a resolving cough secondary to an upper respiratory tract infection as well as mild, intermittent epigastric discomfort and constipation, but did not have obstructive symptoms such as nausea, emesis or obstipation.

Physical examination revealed no lymphadenopathy. There was clear bilateral air entry into the lung bases with no appreciable adventitial sounds. His abdomen was soft with no peritoneal findings. Of note, bowel sounds were particularly prominent even on chest auscultation, and a non-enlarged liver was readily palpable below the costal margin, which we initially attributed to his sarcopenic habitus. Laboratory investigations revealed no anemia, leukocytosis, hypercalcemia, and normal liver enzymes and thyroid stimulating hormone. Fecal occult blood testing and serum protein electrophoresis were also negative. Chest radiographs were obtained to rule out an occult pneumonia (Fig. 1), but instead, elevation of the right hemidiaphragm with bowel below was found, which is consistent with Chilaiditi's sign.

Bowel interposed between the liver and diaphragm was described as early as 1865, and the eponym is attributed to Demetrius Chilaiditi, who in 1910 first proposed a pathophysiological explanation for this radiographic observation [1]. While the precise mechanisms are unknown, the potential space needed for bowel intrusion likely involves a combination of hypermobile bowel mesentery with laxity or absence of the suspensory ligaments of the transverse colon or hepatic falciform ligament [2]. The term Chilaiditi's sign refers to the presence of this asymptomatic anatomical variant on imaging, whereas Chilaiditi's syndrome describes the heterogenous symptoms caused by the interposition and associated diaphragmatic elevation including bowel obstruction, constipation, abdominal or chest pain, and dyspnea [2].

Radiographic detection of Chilaiditi's sign is rare with an estimated prevalence of 0.028–0.25 %; it is four times more likely to be observed in men, and increases with age [3]. Small bowel involvement such as in our patient is even less common, accounting for 3–5 % of cases [3]. Despite the rarity of small bowel interposition, Fig. 1 does illustrate all three classical radiographic features necessary for diagnosis. Specifically, there is a substantial degree of bowel interposition causing right hemidiaphagmatic

✉ Karen K. Leung
kkleung@ualberta.ca

1 Division of Care of the Elderly, Glenrose Rehabilitation Hospital, Room 1263, 10230 111 Avenue Northwest, Edmonton, AB T5G 0B7, Canada

2 Faculty of Medicine and Dentistry, 2J2.00 WC Mackenzie Health Sciences Centre, University of Alberta, 8440 112 Street Northwest, Edmonton, AB T6G 2R7, Canada

3 Department of Family Medicine, University of Alberta, 205 College Plaza, 8215 112 Street Northwest, Edmonton, AB T6G 2C8, Canada

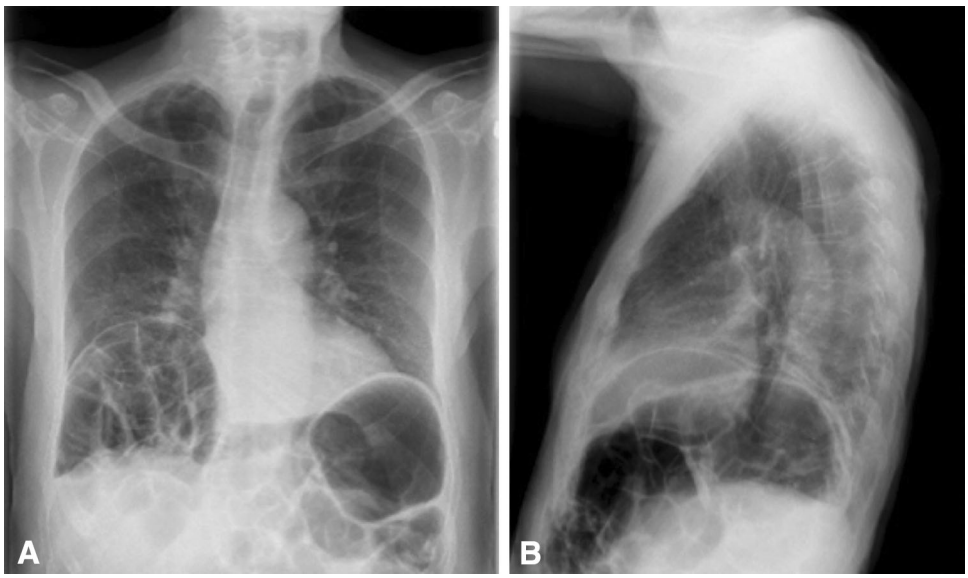


**Fig. 1** **a** Posteroanterior view of a chest radiograph showing bowel loops under the *right* hemidiaphragm. **b** Lateral view of the same chest radiograph showing interposed bowel between the diaphragm and liver

elevation; the interposed bowel is sufficiently distended with air to produce separation of the diaphragm and liver; and the interposition displaces the liver inferiorly such that the upper margin is below the left hemidiaphragm [1].

Awareness of Chilaiditi's sign is relevant to emergency and general medicine for several reasons. Although the bowel haustra and plicae circulares are clearly evident in our radiographs, in instances where there is less bowel insufflation, the crescentic radiolucency overlying the liver can give the impression of free air under the diaphragm or a subphrenic abscess, potentially resulting in unnecessary surgical intervention [3–5]. Computed tomography is the imaging of choice for the hemodynamically stable patient in this situation [4, 5]. Among trauma patients, diaphragmatic herniation and hemidiaphragmatic eventration with paralysis secondary to phrenic nerve damage should be considered [2]. Congenital and acquired medical conditions can further predispose patients, and the presence of Chilaiditi's sign warrants clinical correlation with possible underlying causes such as hepatic lobe agenesis, cirrhosis and ascites, morbid obesity, cachexia, and obstructive pulmonary diseases, which widen the lower thoracic diameter [2–4].

Management of Chilaiditi's syndrome is typically conservative, and may include bed rest, fluid supplementation, and nasogastric decompression if there is an associated bowel obstruction [2]. Our patient did have constipation, but no other obstructive symptoms, and we did not feel his presentation was in keeping with Chilaiditi's syndrome based on clinical assessment. With an aggressive exercise program alongside a high-calorie, high-protein diet, the biometrics improved to 51.4 kg and a BMI of 18.7 kg/m$^2$ without complications such as refeeding syndrome. Of note, we did obtain repeat radiographs prior to discharge home when his abdominal pain and constipation had resolved, and a persistent Chilaiditi's sign remained.

**Compliance with ethical standards**

**Conflict of interest** The authors declare that they have no conflict of interest.

**Statement of human and animal rights** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

## References

1. Lekkas CN, Lentino W (1978) Symptom-producing interposition of the colon. JAMA 240:747–750
2. Kamiyoshihara M, Ibe T, Takeyoshi I (2009) Chilaiditi's sign mimicking a traumatic diaphragmatic hernia. Ann Thorac Surg 87:959–961
3. Weng WH, Liu DR, Feng CC, Que RS (2014) Colonic interposition between the liver and left diaphragm—management of Chilaiditi syndrome: a case report and literature review. Oncol Lett 7:1657–1660
4. Uygungul E, Uygungul D, Ayrik C, Narci H, Bozkurt S, Kose A (2015) Chilaiditi sign: why are clinical findings more important in ED? Am J Emerg Med 33:733e1–733e2
5. Tzimas T, Baxevanos G, Akritidis N (2009) Chilaiditi's sign. Lancet 373:836