**SELF ASSESSMENT ANSWERS**

**Treatment options for common bile duct stones**

**Q1**: What are the treatment options for this patient?

These are summarised in fig 1. Endoscopic extraction of common bile duct stones after sphincterotomy and mechanical lithotripsy has a success rate of up to 95% and is considered the treatment of choice. The reason for failure in this case was the large size of the bile duct calculus. Other reasons include bile duct strictures, unusual anatomy, and calculus beyond reach of the wire basket.

Traditionally such patients have been referred for surgical exploration of the common bile duct but this procedure is not without risk, particularly in elderly patients or those with major medical comorbidities.

Extracorporeal shock wave lithotripsy (ESWL) was investigated initially for treatment of gallbladder stones, but a high stone recurrence rate has limited its use in this condition. In recent years high energy ESWL has been used with more promising results in high risk patients with common bile duct stones. In this case, given the patient's age and comorbidities it was decided that this was the treatment of choice. Biliary drainage was achieved during initial ERCP using a pigtail stent.

The patient then underwent one session of high energy ESWL, during which the calculus was targeted by ultrasonography. Studies have shown that between 20% and 50% of patients will require more than one treatment session. The success rate of this procedure, with complete clearance of the common bile duct is between 80% and 90%.

The main complication is cholangitis (1−8%) and this is reduced by use of prophylactic antibiotics. Procedure related mortality has not been reported.

**Q2**: What does the post-treatment ERCP film (fig 1 in questions; see p 178) show?

At repeat ERCP the pigtail stent was removed and the cholangiogram shows no evidence of calculi with satisfactory drainage from the common bile duct.

Spontaneous passage of calculi occurs in up to 10% of patients, with 80% requiring removal of stone fragments during repeat ERCP. Although recurrence of bile duct calculi is estimated at 14% after one year, most of these are amenable to endoscopic treatment.

ESWL is an effective non-invasive treatment modality that can be performed safely on an outpatient basis, without use of general anaesthesia. For this reason it is a useful treatment option in patients with difficult common bile duct calculi who are considered to be poor candidates for surgery.

**Final diagnosis**

Extracorporeal shock wave lithotripsy as a treatment option for common bile duct calculi.

**References**


**An unusual cause of persistent vomiting**

**Q1**: What abnormality is shown on the barium meal (see p 178)?

An abnormal filling defect in close association with a thin C-shaped radio-opaque strip can be seen in the gastric remnant (grey arrow). Radio-opaque clips can also be seen around the cardia (white arrow). These appearances are in keeping with an Angelchik prosthesis which has become detached and eroded into the stomach.

**Q2**: What are the options for dealing with this complication?

Gastroscopy should be performed not only to confirm the diagnosis but also in an attempt to remove the prosthesis endoscopically. At gastroscopy the stomach mucosa appeared normal and the silicon prosthesis, although covered with debris, was easily visualised. However, despite several attempts, it was not possible to retrieve the prosthesis endoscopically. The only other option was to remove the prosthesis surgically and this was performed in this case by carrying out a laparotomy and gastrectomy. The patient made an uncomplicated recovery and was free of symptoms at review three months later.

**Q3**: What other complications have been reported after insertion of this prosthesis?

The Angelchik prosthesis is no longer widely used because of the high incidence of complications. Intractable dysphagia was common and often required removal of the prosthesis. Free extraluminal migration into the abdominal cavity can occur. The prosthesis usually comes to rest in the pelvis and is usually manifested by chronic lower abdominal pain or urinary symptoms. Migration into the mediastinum and distal slippage has also been reported. Erosion of the prosthesis into the oesophagus can lead to abscess formation and intraluminal erosion may even progress to cause small bowel obstruction.

**Discussion**

In 1979, Angelchik and Cohen reported a series of 46 patients who had reflux oesophagitis treated surgically with the insertion of an incomplete “doughnut” shaped ring of silicon around the gastro-oesophageal junction: the

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**Figure 1** Treatment options for common bile duct stones (CBD, common bile duct; ERCP, endoscopic retrograde cholangiopancreatography; ESWL, extracorporeal shockwave lithotripsy).
Angelicch prosthesis. The C-shaped ring was tied around the lower oesophageal with Dacron straps. Insertion of this prosthesis was quick, simple to perform, and standardised to other accepted surgical antireflux procedures. However, the initial enthusiasm has been tempered with experience and when more long term results were analysed up to 20% of prosthesis had to be removed for intractable dysphagia and there were other reports of significant problems due to migration and erosion of the prosthesis.

The prosthesis has a tantalum radio-opaque marker encircling its periphery and radio-opaque clips were frequently used to reinforce the knot in the tied Dacron straps making it possible to identify the prosthesis on radiological images as seen in this case.


A limping 6 year old child with no history of illness or trauma

Q1: What is the likely diagnosis and how does it typically present?

Legg-Calvé-Perthes (LCP) disease, also known as idiopathic avascular necrosis of the proximal femoral epiphysis, is one of the more insidious causes of a limp in the paediatric population. It is more common in boys than girls and has been shown to be associated with protein C and protein S deficiencies as well as various other thrombophilias.

Clinically, LCP disease presents between the ages of 5 and 7, although it has been reported in children ranging from the ages of 2 to 16. Although its aetiology remains unclear, it is three times more common in boys than girls and has been shown to be associated with protein C and protein S deficiencies as well as various other thrombophilias.

In our case, the child was a 6 year old boy with a slow developing and gradually worsening limp, which may or may not be painful. Associated pain is usually activity related and relieved by rest. The pain is usually localised to the groin, inner thigh, or knee region. On examination, these children will have a positive Trendelenburg test and have limited abduction and difficulty medially rotating their affected leg. Often, they also have trouble with hip motion. With disease progression, necrosis of the femoral head leads to further degeneration and immobilisation of the hip, which can then progress to disuse atrophy of the buttocks, thigh, and calf muscles.

Q2: What are alternative differential diagnoses in a child with a limp?

The differential diagnosis list for a child with a limp is quite extensive and can include various hormonal, metabolic, orthopaedic, and genetic causes. Frequent causes of limp also vary by age group. In the 4–11 year old age group, the most common causes of a limping gait are: septic arthritis, osteomyelitis, tarsal coalition, transient monarticular synovitis, LCP, slipped capital femoral epiphysis, and neoplasias such as osteoid osteomas or osteochondromas.

Q3: What complications may arise during the management of such patients?

If the surgeon is unaware of the possibility of herniated bladder forming hernal sac, the bladder may be inadvertently damaged during the hernia repair.

Discussion

This is a rare condition where there is herniation of the bladder into the forming wall of the inguinal canal to prevent recurrence of the hernia.

The management of this condition depends on the diagnosis and divided into two phases. (A) Repair of the inguinal hernia, which is the main cause of the pain, using a form of wire mesh to reinforce the posterior wall of the inguinal canal to prevent recurrence of the hernia. (B) Repair of the bladder diverticulum by open diverticulectomy or laparoscopic diverticulectomy.

Final diagnosis

Herniation of the bladder.

References


An elderly man with chest pain, shortness of breath, and constipation

Q1: What do the chest radiographs show?
The upright posteroanterior and lateral films (see p 120) show a marked elevation of the right hemidiaphragm with distended loops of bowel interposed between the liver and right abdominal wall. Haustration identifies the large bowel, distinguishing colonic hepatopulmonary interposition from subphrenic pseudoneumothorax or abscess. The lung fields and pleural spaces are clear. Note the normal heart size and median sternotomy wires. Interestingly, the hepatopulmonary interposition of the right colon had not been seen on films taken five and seven years previously, but persisted after complete resolution of symptoms and still present on follow up two weeks later. The computer tomogram confirmed the hepatopulmonary interposition of the colon and did not show any signs of pulmonary embolism.

Q2: What important physical sign may have been missed?
Absent liver dullness may be a useful diagnostic clue pointing to hepatopulmonary interposition.

Q3: What is the differential diagnosis?
The differential diagnosis must include a number of cardiac and non-cardiac causes of chest pain and breathlessness. The initial approach would be to rule out life threatening causes such as myocardial ischaemia and pulmonary embolism as well as acute pneumo-nia. In this patient the diagnostic difficulty was compounded by the history of coronary artery disease and high risk of pulmonary embolism (postoperative state and malignancy). The pain occurred on walking (characteristic for angina), was intensified by inspiration (waking pleuritic pain typical for pulmonary infarction), and was associated with shortness of breath and hypoxia. However, the pain lasted from 30 minutes to two hours, was not associated with new ECG changes nor elevation of cardiac enzymes, it responded to bed rest (but not to nitrates), and a computed tomographic pulmonary angiogram revealed no pulmonary embolism. Absence of fever, productive cough, spu tum, and the chest radiograph findings tend to exclude pneumonia. The patient became asymptomatic when constipation was successfully treated with enemas, stool softeners, and laxatives. However, to verify that colonic hepatopulmonary interposition is the only cause of angina-like pain, other investigations may be needed to exclude coronary ischaemia.

Q4: What were the predisposing factors to this condition?
Colonial elongation due to longstanding constipation and probably adhesions (after prior stomach surgery) in an elderly patient (after hip fracture) with limited mobility taking a narcotic analgesic.

Q5: What is the management of this condition?
Most patients are treated conservatively with bed rest, increased fluid intake, fibre supplementation, laxatives, and enemas. In rare complicated cases (volvulus, internal hernias, intestinal obstruction, subdiaphragmatic appendicitis) appropriate surgical intervention is required. In our patient, who was treated conservatively, the symptoms completely disappeared after he opened his bowels with no recurrence or complications on follow up (for two months) since treatment of constipation started.

Discussion
A temporary or permanent hepatopulmonary interposition of the colon, small intestine (tine), or stomach (exceptionally rare) is an uncommon and usually asymptomatic process. However, it can cause serious complications and be a potential source of misdiagnosis for a variety of intraabdominal and intra-abdominal disorders.
The condition was named after Viennese radiologist Demetrius Chilaiditi who in 1912 described three asymptomatic cases with temporary hepatopulmonary interposition of the colon and described their anatomicraphicographic aspects. The condition was first described by Cantini in 1865, and Beclere in 1899 presented the necropsy and roentgenological findings he thought to have a subdiaphragmatic abscess.1 It has been proposed to use the term “Chilaiditi’s sign” in asymptomatic patients and the term “Chilaiditi’s syndrome” in symptomatic patients.1,2

In Western countries the condition is uncommon and is found in 0.2% to 0.2% of routine chest radiographs with a male to female ratio of 4:1.3 In some reports the incidence is even lower with only 0.002% (of 50 000 adults)4 or 0.000003% (three of 1 378 000).5 Importantly, an increase in prevalence of hepatopulmonary interposition has been recorded in patients above 65 years of age: from 0.2% to 0.2% in men and from 0.06% to 0.2% in women.6 In one study the prevalence in the geriatric population was found to be 1%.7 In 135 persons with learning disabilities in New York, the incidence was 8.8%, or 63 times that in general population.8 A high incidence of hepatopulmonary interposition was observed in Iran: 0.22% in the normal population, 2% in women near term pregnancy, 2.7% in patients with chronic lung disease, and 22% in patients with postnecrotic cirrhosis.9

The normal anatomy and physiology of the intestine, liver, and diaphragm are very much related and includes an enlarged subphrenic space, congenital and/or acquired elongation, reduction of liver volume (lobar agenesis), and mechanical obstruction.10 A temporary or permanent hepatopulmonary interposition of the colon and usually the right lobe of the liver are much rarer. A case of combined anterior and posterior types of colon displacement has been reported.11 Only a minority of patients with intestinal hepatopulmonary interposition have symptoms. These range from non-specific gastrointestinal symptoms such as nausea, anorexia, vomiting, flatulence, and constipation to signs of pseudo-obstruction and rarely to life threatening complications like volvulus or intestinal obstruction. The condition may raise the clinical suspicion of central chest pain, cardiac arrhythmias, or respiratory distress. Symptomatic patients usually become symptomatic in a sitting position or standing upright while bed rest diminishes the symptoms.7 Our case is unusual in that the patient developed uncommon symptoms of chest pain and breathlessness (without gastrointestinal symptoms apart from constipation). After complete resolution of clinical symptoms, in many cases the radiological picture of intestinal hepatopulmonary interposition remained unchanged (as in our patient), indicating the importance of colonic distention in the pathophysiology of the syndrome.

A wide range of coexisting disorders has been reported including hiatus hernia, scleral abnormalities (spinal scoliosis), multiple congenital anomalies, obesity, pneumotosis cystoides intestinalis, melanosis coli, and lung cancer. Severe complications requiring surgery such as volvulus, incarceration of colon, and supphrahepatic appendicitis have been reported.7,11,12 On physical examination a marked decrease or even absent liver dullness and/or a “mass” in the right upper quadrant or mid-abdomen (displaced liver) may be diagnostically useful.

Box 1: Factors predisposing to intestinal hepatopulmonary interposition

1. Anatomical
   - Congenital elongation, malrotation, or malfixation of the bowel.
   - Redundant bowel with a long mesentery.
   - Congenital or acquired laxity of hepatic suspensory ligaments.
   - Reduction of liver volume (lobar agenesis, atrophic cirrhosis).
   - Lower thoracic outlet enlargement with high abdominal pressure gradient (pregnancy, obstructive airway disease, emphysema, scoliosis, asciates).
   - Adhesions and mechanical obstruction.
   - Obesity.

2. Functional
   - Increased intestinal mobility.
   - Longstanding constipation (due to immobilisation, diet, medication, etc).
   - Gaseous distention of the intestine (meteorism).
   - Diaphragm paralysis (centrally mediated or due to phrenic nerve injury).
   - Aerophagia.
Radiologically three signs are characteristic: (1) colon or small bowel interposed between the liver and the diaphragm (in symptomatic patients usually markedly distended), (2) elevated right hemidiaphragm, and (3) caudal and medial displacement of liver. However, wide the bowel gas is lateral and posterior it may not get above the liver or displace it; this is termed incomplete hepatodiaphragmatic interposition.6

The differential diagnosis of radiographic findings include subdiaphragmatic abscess, pneumoperitoneum, cysts in pneumatosis intestinalis, hepatomegaly, posterior hepatic lesions, and retroperitoneal masses. In the first two of these conditions, which are associated with elevation of the right hemidiaphragm and subdiaphragmatic air collection, the haustial markings (usually best seen on lateral films) are absent. With pneumoperitoneum the free air is shifting (usually obvious in the lateral decubitus view) and may be bilateral. In subdiaphragmatic abscess, the air-fluid level is smaller and often associated with basal atelectasis and pleural effusions. Hepatodiaphragmatic interposition of the intestine may also be diagnosed with abdominal ultrasound.13 If doubt remains, contrast enema, thoracoabdominal computed tomography or nuclear scintigraphy are recommended.

Chilaiditi’s syndrome may present with a wide range of symptoms and signs which could be misleading to the attending clinician. The entity may mimic a number of cardiac, respiratory, and other non-cardiac disorders. The clinical differential diagnosis may be particularly difficult in elderly persons because of the frequent coexistence of two or more conditions contributing to the clinical picture (as in the described case). Although in patients with chest pain, the differential diagnosis initially must include myocardial ischaemia, pulmonary embolism, aortic dissection or pericarditis, other types of non-cardiac chest pain should also be considered. Constipation and colonic distention as a cause of praecordial pain,5,8 hypoxia, and respiratory distress13,14 has been described but infrequently diagnosed. Constipation which is common in elderly people affecting a third of elderly women and a quarter of elderly men,15 is a significant predisposing factor for intestinal hepatodiaphragmatic interposition.

This case emphasised the importance of considering Chilaiditi’s syndrome in differential diagnosis of chest pain and dyspnoea, especially in elderly people, as well as in patients with intellectual disability, chronic lung disease, or cirrhosis.

Final diagnosis
Colonic hepatodiaphragmatic interposition (Chilaiditi’s syndrome).

References
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