

ABSTRACT

In a patient presenting with upper abdominal discomfort, one must consider not just the intra-abdominal organs that are related anatomically to that region, but recognize that organs that are outside the abdominal cavity and systemic illness can also cause symptoms referable to the upper abdomen. The physical examination of a patient with upper abdominal symptoms follows the time-proven steps of observation, palpation, percussion and auscultation. The choice for the right investigations is crucial in investigating symptoms of the upper abdomen. Investigations must be based on the history, physical examination and list of possible diagnoses. It is important to remember that an inappropriate investigation with negative results does not exclude certain pathology. Upper abdominal pain is very common condition. It is not practical or required for every patient with this symptom to be thoroughly investigated before instituting treatment. Empirical treatment can be offered to most patients after a detailed history, physical examination and some basic investigations are found to be negative. Follow up of the patient to the resolution of symptoms is good practice. Referral may be needed if there are red flags or the patient is not improving as expected.

SFP 2008; 35(1): 23-28

INTRODUCTION TO THE ANATOMICAL SEGMENTS OF THE ABDOMINAL WALL AND ITS VISCERAL ASSOCIATION

The anterior abdominal wall can be divided in 9 segments using 2 vertical and 2 horizontal lines. The 2 vertical lines are joined by the mid-clavicular point to the mid-inguinal point on each side. The 2 horizontal lines are drawn across the lowest point of the subcostal margin for the higher line and across the iliac crest for the lower line.

The 3 upper segments are the right hypochondrium (RHC), the epigastrium, and the left hypochondrium (LHC). The middle 3 segments are the right lumbar, the periumbilical and the left lumbar region. The lower 3 segments are the right iliac fossa (RIF), the suprapubic region and the left iliac fossa.

During the embryonic development, various viscera were

developed from tissue associated with specific dermatomes. Hence, upper GI symptoms are usually referable to the epigastrium, small intestinal pathology presents with symptoms in the periumbilical region and colonic pathology symptoms are usually felt in the suprapubic region. This is generally true when the pathology does not involve the serosa and the adjacent parietal peritoneum. When the parietal peritoneum is involved, the symptoms can be localized to the segment that the viscus is situated anatomically. A classic example is acute appendicitis that presents with periumbilical pain in the early stage. The pain will subsequently migrate to the RIF when the serosa and parietal peritoneum is involved with the inflammation. Together with signs of peritonism like guarding and rebound tenderness, these signs and symptoms formed the classic picture of acute appendicitis.

ORGANS WITH SYMPTOMS REFERABLE TO THE UPPER ABDOMEN

Symptoms in the upper abdomen can be further segregated into RHC, epigastrium or LHC in location. Organs that can present with symptoms in the RHC include the liver and gallbladder. Occasionally, pathology in the duodenum can present with discomfort more in the RHC than the epigastrium. Organs that present with symptoms referable to the epigastrium include the stomach, duodenum, lower esophagus, liver (especially the left lobe) and gallbladder. Disease of the transverse colon, when involving the serosa and peritoneum can present with symptoms referable to the epigastrium. Deep organs like the pancreas can also present with epigastric pain with the pain typically radiating to the back. A commonly forgotten cause of abdominal pain is vascular occlusion. Mesenteric occlusion usually cause severe, deep and poorly localized pain associated with diaphoresis, nausea and even hypotension from sympathetic effects. Pain becomes localized when bowel infarction results in serosal and peritoneal inflammation.

In addition to abdominal viscera causing symptoms in the epigastrium, organs outside the abdominal cavity can cause symptoms in the upper abdomen. Inferior acute myocardial infarction present with epigastric rather than chest pain. Lower lobe pneumonia with pleurisy can have pain over the epigastrium rather than over the chest. Neuropathic pain like herpes zoster can present with acute epigastric pain before the onset of blisters. Systemic illness can present with epigastric pain as well. Epigastric pain is a feature of dengue shock or impending dengue shock. Tetanus can present with a board-like abdomen that mimic a surgical emergency. Other metabolic disorder like diabetic ketoacidosis, addisonian crisis, thyroid storm and hemolytic crisis

can present with severe epigastric pain. These possible etiologies must not be forgotten when addressing a patient with epigastric pain. Symptoms referable to the LHC are seldom encountered in clinical setting. Splenic enlargement and splenic infarct can cause pain over the LHC. Pathology at the tail of pancreas can present with pain over the LHC as well.

Hence, in summary, when encountered with a patient with upper abdominal discomfort, one must consider not just the intra-abdominal organs that are related anatomically to that region, organs that are outside the abdominal cavity and systemic illness can also cause symptoms referable to the upper abdomen.

CLINICAL PRESENTATION OF UPPER GASTROINTESTINAL PATHOLOGY

Different causes of upper abdominal symptoms present with different symptomatology that gives the clinician a clue to what is the most likely cause of the symptoms.

Pain

The standard characteristics of the pain must be elicited as this gives a very good clue to the etiology of the symptoms. These characteristics include:

- a) Location
- b) Duration
- c) Nature
- d) Radiation
- e) Aggravating factors
- f) Relieving factors

Pain from stretch of the liver capsule from hepatic congestion or hepatic tumor is often presents as a vague RHC discomfort. The discomfort is worsened with fluid overload and is relieved by fluid restriction or diuretics. The discomfort is usually constant and last for as long as the capsule is stretched.

Biliary colic on the other hand is well recognized and described. The pain typically last for a few hours. The pain is described as crampy in nature. The intensity of the pain is usually constant or waxes and wanes a little with no pain-free interval in between. This is in contrast to abdominal colic when there is pain-free interval between episodes of colic. Biliary colic is aggravated by oily meal and is usually relieved spontaneously. If the serosa of the gallbladder is not involved, the pain is over the epigastrium. When there is serosal inflammation, the pain is localized to the RHC with radiation to the right shoulder tip. Pain and guarding over the RHC (Murphy's sign) with rebound tenderness is a reflection of gallbladder serosal inflammation.

If the pain, described as a burning sensation starting from the epigastrium radiating up the retrosternal region, this is a typical description of heartburn. The condition of gastro-esophageal reflux disease is often associated with post-meal bloating and

excessive belching. Patients may experience some relieve in symptoms after belching. The pain is often exacerbated by a large volume meal, lying down after eating and after alcohol intake. In some patients, the pain can be so severe that there are sympathetic symptoms mimicking an acute myocardial infarction. It is important to perform an ECG on such patients while in pain to ensure that the ECG is normal to exclude a coronary event.

Peptic ulcer disease symptoms are usually localized to the epigastrium. The pain is usually described as burning in nature. The pain is triggered by hunger. Gastric ulcer pain tends to exacerbates after meals whereas duodenal ulcer pain is relieved by meals. In peptic ulcer disease affecting the posterior wall of the duodenum, the pain can be radiating to the back. Nausea and vomiting is a feature of peptic ulcer disease. One must be watchful for acute emergencies that can arise from peptic ulcer disease. Acute peptic ulcer perforation can result in acute peritonitis and septic shock. Acute bleeding from peptic ulcer is also a complication with significant morbidity and mortality. Hence, it is important to ascertain that in a patient with a history suggestive of peptic ulcer disease, a history or absence of hematemesis and melena must be elicited and if present, will warrant urgent investigation and treatment.

Pain from acute pancreatitis is often described as severe. It is associated with sympathetic discharge with nausea and diaphoresis. The pain radiates to the back and usually requires narcotic analgesia for relief. Acute pancreatitis can be precipitated after an oily meal. The pain is cresendric and stays plateau at the maximum. It may be associated with cholangitis if the etiology for the pancreatitis is biliary stones. The pain may be partially relieved by crouching forward. It is important to achieve early diagnosis of acute pancreatitis as there is significant third spacing and without early resuscitation, results in multi-organ failure. In chronic pancreatitis, the epigastric pain is also constant and debilitating. The pain typically radiates to the back and usually require narcotics for relieve. In pancreatic cancer, the pain is similar in nature to that of chronic pancreatitis. Pain fibers from pancreas run along with the sympathetic fibers. Hence, in patients with pancreatic cancer, celiac plexus block can offer significant relief.

Acute vascular event can cause severe pain over the epigastrium as well. Vascular events are usually sudden in onset. In dissection of the abdominal aorta, the pain is described as severe and tearing in nature. Mesenteric vascular occlusion usually causes severe pain which is poorly localized. The clue is the sympathetic symptoms that accompany the pain.

Finally, neuropathic pain due to nerve root entrapment or zoster can also cause pain over the epigastrium. Disease of the transverse colon involving the serosa can also cause epigastric pain.

Bloating

The other symptom that is commonly encountered in the upper abdomen is bloating. Bloating is a sensation of fullness and a

“stretch” feeling. Other ways of description include indigestion, early satiety or feeling of food stuck in the stomach. It is usually worse post-meal and is associated as well as relieved by belching. Bloating is a common symptom for innocuous disorder like gastroesophageal reflux disease, non-ulcer dyspepsia and peptic ulcer disease. However, serious disease like gastric cancer with or without gastric outlet obstruction, linitus plastica and lymphoma of the stomach presents with bloating and early satiety as well. Pancreatic and periampullary tumor can cause bloating as well by causing gastric outlet obstruction. It is hence important to ask for associate alarm signs and symptoms like significant weight loss and anemia¹. Patients with gastric outlet obstruction or structural cause for gastric hypomotility (gastric lymphoma or linitus plastica) will experience recurrent vomiting with undigested food from 1 to 2 meals ago. These symptoms if present, warrants urgent referral for investigations.

Weight loss

Weight loss is another important symptom that is expressed by patients with upper GI pathology. Patients with weight loss suggest strongly the presence of significant pathology. However, patients with non-ulcer dyspepsia and depression can have significant weight loss as well.

In an adult population, the body weight is not expected to fluctuate significantly unless there is an intention. Significant weight loss is defined as loss of >10% of their body weight². Patients with gastric ulcer may have weight loss as eating can aggravate the pain. Conversely, patients with duodenal ulcer tend to gain weight due to recurrent eating to relieve the pain.

In patients with significant weight loss, one must be extremely careful to exclude gastrointestinal malignancies as a cause. Gastrointestinal malignancies caused weight loss by mechanical obstruction and by increasing production of certain cytokines causing a catabolic state³. Esophageal carcinoma presents as dysphagia. Patients with esophageal carcinoma develop progressive dysphagia with gradual inability to swallow solids to liquid food resulting in decrease in caloric intake. Patients with gastric carcinoma can result in gastric outlet obstruction and recurrent vomiting. The inability of the stomach to relax to accommodate the volume of food results in small volume of food intake and early satiety. Small intestinal carcinomas are rare but can also cause small bowel obstruction. In addition to carcinoma, gastric lymphomas can result in very significant weight loss by constricting the volume of the stomach.

Other symptoms

Other symptoms referable to pathology of the upper gastrointestinal tract are symptoms of anemia. Patients with gastrointestinal pathology may suffer from occult blood loss. The rate of blood loss, if slow, does not present with symptoms till the hemoglobin level is very low. Patients with gastric ulcer or carcinoma have presented with hemoglobin less than 7 to

8 g/dl and they may be fairly asymptomatic especially if they have a sedentary lifestyle. Hence, it is imperative to ask patient specifically for symptoms of effort intolerance and lethargy suggestive of anemia. Other symptoms include nausea, loss of appetite and intolerant to certain food types are non-specific in isolation but may suggest certain pathology when combined with other symptoms.

PHYSICAL EXAMINATION OF PATIENTS WITH UPPER ABDOMINAL SYMPTOMS

The physical examination of a patient with upper abdominal symptoms follows the time-proven steps of observation, palpation, percussion and auscultation.

Observation is not confined to the abdomen but also the patient as a whole. Wasting of the temporalis and gluteal muscles suggest significant weight loss. Conjunctival and mucosal pallor can be evident clinically. Pallor of the nail beds is also a sign of anemia. Jaundice can be seen in patients with biliary obstruction. Leuconychia and koilonychia can be seen in patients with hypoalbuminemia and iron deficiency anemia respectively. The presence of palmer erythema suggests that the patient have chronic liver disease. At the epigastrium, a mass can be seen moving with respiration. This can be a mass arising from the left lobe of the liver or a large gastric mass. The abdomen can be grossly distended by gas in patients with intestinal obstruction or with fluid in a patient with ascites from liver disease or peritoneal metastasis. Distended veins over the abdominal wall suggest either portal hypertension or IVC obstruction.

Palpation of the abdomen is divided into 2 stages. The 9 abdominal segments should first be superficially palpated for tenderness. Each segment is then palpated deeply for masses. It is important to go back to the basic clinical examination technique to determine if the mass moves well with respiration, the direction of the movement, and whether one can get above the mass. These will help to distinguish a liver mass, a gastric mass, a splenic mass and a renal mass from each other. During palpation, it is also important to delineate the size of the mass. If there are distended veins over the abdominal wall, it is important to ascertain the direction of flow in veins below the umbilicus. A cephalic direction of flow in these veins suggests IVC obstruction while a caudal direction of flow suggests portal hypertension.

Percussion of the abdomen is particularly important to ascertain if the distension is due to gaseous distension or fluid. The presence of shifting dullness is synonymous with ascites. Percussion over any palpable masses will assist in delineating the origin of the mass. For example, a mass over the LHC when dull to percussion is most likely an enlarged spleen while if resonant to percussion is most likely an enlarged left kidney.

Auscultation is often forgotten in an abdominal examination. Tingling bowel sounds are heard in patients with intestinal obstruction. Bowel sounds will be absent in patient with

peritonitis. Bruit over a mass suggests that the mass is vascular and is likely to be a malignancy. Finally, it is important to listen for abdominal bruit not just over the renal arteries but also the abdomen in general for signs suggestive of mesenteric ischemia.

RELEVANT INVESTIGATIONS

Investigations in patients with abdominal symptoms are directed by the history and physical examination to delineate the possible etiology. Relevant blood investigations include full blood count to ascertain the presence and type of anemia. Liver function test in a patient with jaundice will be relevant to ascertain to if the jaundice is obstructive or hepatitic. Serum amylase and lipase will be elevated in a patient with acute pancreatitis. Imaging evaluation can be critical in some patients. Plain X ray films may reveal multiple fluid levels in patients with intestinal obstruction. Free gas under the diaphragm is synonymous with bowel perforation and is a surgical emergency.

In a patient without acute abdominal symptoms, a plain x-ray is usually not useful. Transabdominal ultrasound is useful in detecting gallstones and biliary dilatation due to obstruction. Cyst, metastasis, abscesses and other space occupying lesion > 2 cm in the liver can be reliably detected on transabdominal ultrasound. Lesions smaller than 1 cm diameter cannot be reliably detected or characterized on transabdominal ultrasound⁴. CT scan and MRI imaging are useful for looking for pathology in the liver and deeper solid organs like the pancreas. The resolution is better than transabdominal ultrasound and space occupying lesion >1 cm can be delineated. In addition, computer reconstruction is possible to delineate structures and lesions. For example, reconstruction can be performed to provide a diagnostic cholangiogram (MRCP; magnetic resonance cholangiopancreatogram). Hence, the indications for diagnostic ERCP is diminishing and is hardly performed now⁵. Pathology in the luminal organs are best visualized by the endoscope. A biopsy can be performed simultaneously for histological diagnosis.

Of recent interest is the test for *H.pylori* in our patients. This can be a serological test, urea breath test (UBT), rapid urease test or histology and culture. In a patient who has never been treated before for *H.pylori* infection, a positive serology strongly suggests active infection⁶. 13C-UBT is another reasonable test to detect *H.pylori*. It is currently used in patients to test for *H.pylori* eradication post-treatment. 13C-UBT has a sensitivity of 94.2% and a specificity of 100%⁷. It may be reasonable to treat young patients with *H.pylori* eradication therapy as that offer a cure for *H.pylori* associated peptic ulcer. However, *H.pylori* is also associated with gastric cancer⁸. In Singapore, the incidence of gastric cancer starts to increase at the age of 40⁹. Hence, it is prudent that patients at risk of developing gastric cancer are not empirically tested and treated for *H.pylori* infection¹⁰.

In summary, the choice for the right investigations is crucial

in investigating symptoms of the upper abdomen. Investigations must be based on the history, physical examination and list of possible diagnoses. It is important to remember that an inappropriate investigation with negative results does not exclude certain pathology.

EMPIRICAL TREATMENT

Upper abdominal pain is very common condition. It is not practical or required for every patient with this symptom to be thoroughly investigated before instituting treatment. Empirical treatment can be offered to most patients after a detailed history, physical examination and some basic investigations. In a young patient with a recent onset of abdominal pain, a short course of symptomatic treatment may be all that is needed. The symptoms resolved without recurrence and the patient need not undertake the risk or pay for costly investigations. The risk of managing the patient this way is the delay in establishing bad diagnoses like GI malignancies. Hence, there must be in place a safe system to reduce the risk of this outcome or any delay from this approach will not result in a worse outcome for the patient.

Medications like proton pump inhibitors, given in maximum dose, can alleviate symptoms of reflux esophagitis as well as serve as a therapeutic trial. Prokinetics can be helpful in patients with bloating while anti-spasmodic may be helpful in patients with colicky abdominal pain. It is known that these medications can provide some symptomatic relief even in patients with GI malignancies. To ensure that there are no unnecessary delays in diagnoses, there are some guides to empirical treatment.

- i) Take a detailed history on the presenting complains including the duration of symptoms.
- ii) Document the absence or presence of alarm symptoms and signs.
- iii) Pre-determine the period of empirical treatment and when the patient will be sent for further evaluation if there is no resolution of symptoms.
- iv) Start the appropriate empirical treatment based on history and physical examination.
- v) Review the patient after a short duration (about 2 weeks) of empirical treatment¹¹. Refer for further evaluation if there is no symptomatic relief.
- vi) If the patient experience symptomatic relief, review the patient again in 4 to 6 weeks after stopping medications. A recurrence of symptoms warrants further investigations. If there are no recurrence, document stability in weight and absence of alarm symptoms and signs before closing the episode for that presenting complain.
- vii) The plan for empirical treatment must be documented, outlined and explained to the patient at the start of the therapy. Some patients may not be agreeable to the "delay" in diagnosis and will want rapid investigation before treatment.

CASE STUDIES

Case 1

A 33-year-old man complains of recurrent epigastric pain for 6 months. He was treated with over the counter antacids with temporary relief. What are the relevant points in the history?

a) What is the nature of the pain?

The pain was described as a dull ache over the epigastrium. The ache is burning in nature

b) What are the aggravating factors?

The pain is aggravated by hunger. If he takes pain-killers, it will precipitate the pain.

c) What are the relieving factors?

The pain is relieved by food. There is also temporary relief with antacids.

d) Any radiation of the pain?

The pain radiates to the back.

e) Any other associated symptoms or history?

The pain is associated with bloating and excessive belching. There is no significant weight loss. There was no history of hematemesis or melena.

His father had gastric cancer and died at the age of 58 years old.

Physical examination was essentially normal except for mild tenderness over the epigastrium.

What is your provisional diagnosis and what is your investigation of choice?

The provisional diagnosis is peptic ulcer disease and the investigation of choice is an OGD.

Discussion:

- 1) Does it make a difference if the patient has gastric ulcer or duodenal ulcer?
- 2) Is the *Helicobacter pylori* status of this patient important even if there were no ulceration?
- 3) Can we do a *H.pylori* serology or breath-test for *H.pylori* and treat accordingly without an OGD?
- 4) What is your treatment of choice if he has *H.pylori* positive duodenal ulcer.
- 5) Is there any precaution in future medications and what is the chance of *H.pylori* recurrent infection in this man?

Case 2

A 65-year-old man presented with epigastric pain for 6 months. He was treated with over the counter antacids without relief. What are the relevant points in the history?

a) What is the nature of the pain?

The pain was described as a dull deep ache over the

epigastrium. The ache is persistent and progressive and wakes patient up at night from his sleep.

b) What are the aggravating factors?

The pain is aggravated at times by food.

c) What are the relieving factors?

There is only mild temporary relief with NSAIDS.

d) Any radiation of the pain?

The pain radiates to the back.

e) Any other associated symptoms or history?

There is significant weight loss of 10 kg over the last 6 months. There was also loss of appetite. He has a history of significant alcohol consumption.

Physical examination showed cachexia with tenderness over the epigastrium. The abdomen is not distended and there was no evidence of ascites.

What is your provisional diagnosis and what is your investigation of choice?

The provisional diagnosis is GIT malignancy. The investigation of choice will be a CT scan of the abdomen.

Discussion:

- 1) What are the points in the history and physical examination that directs the suspicion to a malignancy?
- 2) What malignancy is this most likely to be?
- 3) Assuming patient refuses or is not suitable for curative surgical intervention, what signs and symptoms you would have looked for in your palliative care of this patient?
- 4) If the CT scan is reportedly normal, what is your next cause of action? Is tumor markers level useful in this situation?

Case 3

A 18-year-old lady complains of recurrent epigastric pain for 3 years. The pain was temporarily relieved by antacids. Her usual weight was 48 kg but over the last 1 year, there has been significant weight loss of 5 kg. What are the relevant points in your history and physical examination?

a) What is the nature of the pain?

The pain was described as a dull deep ache over the epigastrium. The pain is described as vague.

b) What are the aggravating factors?

The pain is aggravated both by hunger and after eating. It seemed to be present most of the time.

c) What are the relieving factors?

There is some temporary relief with antacids and some over the counter "gastric medications". There were "worse off" days where she'll have to rest in bed and take only liquid food. The condition will be better after 1 to 2 days of rest.

d) Any radiation of the pain?

The pain radiates at times to the periumbilical region as well as to the flanks.

e) Any other associated symptoms or history?

There is significant weight loss of 5 kg over the last 12 months. Appetite was variable. There was significant bloating and belching post-meal. Bowel habits are a little irregular and are constipated most of the time.

What other symptoms will you ascertain in the history?

- a) What is the sleep pattern?
- b) How is she coping socially?
- c) Is there any pattern between the abdominal pain and the school life?
- d) Was her weight a straight decline or was it fluctuating?

What is your provisional diagnosis and what is the choice of your investigations?

The patient had an OGD which was structurally normal but was noted to be *H.pylori* positive.

Discussion:

- 1) What is the most likely diagnosis?
- 2) What is your next course of action?
- 3) How will you monitor this patient?
- 4) Is more investigation helpful or harmful to the management of this patient?
- 5) Is there any benefit in the eradication of *H.pylori*?

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LEARNING POINTS

- **One must consider not just the intra-abdominal organs that are related anatomically to that region, but recognize that organs that are outside the abdominal cavity and systemic illness can also cause symptoms referable to the upper abdomen.**
- **The physical examination of a patient with upper abdominal symptoms follows the time-proven steps of observation, palpation, percussion and auscultation.**
- **The choice for the right investigations is crucial in investigating symptoms of the upper abdomen. Investigations must be based on the history, physical examination and list of possible diagnoses.**
- **It is important to remember that an inappropriate investigation with negative results does not exclude certain pathology. Upper abdominal pain is very common condition. It is not practical or required for every patient with this symptom to be thoroughly investigated before instituting treatment.**
- **Empirical treatment can be offered to most patients after a detailed history, physical examination and some basic investigations are found to be negative.**
- **Follow up of the patient to the resolution of symptoms is good practice. Referral may be needed if there are red flags or the patient is not improving as expected.**