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Acute Abdomen

Abdominal pain is one of the most common chief complaints for patients presenting for emergency medical care, regardless of age [1]. Older patients tend to present to medical attention in a more delayed fashion. For appendicitis and other intra-abdominal infections, the average duration of symptoms prior to presentation is 1–5 days longer in elderly patients compared to younger patients [2, 3].

Perhaps because of the tendency toward later presentation and the presence of comorbidities, older patients tend to have higher acuity of disease compared to younger patients with similar complaints and diagnoses. Forty to sixty percent of geriatric patients with acute abdominal pain require hospital admission, 10–30 % will require an operation or invasive procedure, and ultimately, the mortality rate is 5–8 %. The rates of admission and invasive intervention are roughly twice as high as those for younger patients with similar presentations, and the mortality rate is as much as five- or ten-fold higher [4–7]. Accurately determining the diagnosis and the need for an operation in a timely fashion is both important and challenging in this patient population.

History and Physical Exam

A careful and complete history is fundamental to the evaluation of the acute abdomen. Unfortunately, geriatric patients presenting with acute abdominal symptoms often have non-specific abdominal pain, leading to diagnostic inaccuracy

which increases with age [6, 7]. Memory loss, with or without dementia, affects 3–8 % of the elderly population, which can present a significant obstacle to obtaining an accurate history [8, 9]. Furthermore, 25–45 % of elderly patient have significant hearing loss that can impair speech recognition in noisy settings such as the emergency department [10].

The presence of a family member, caretaker, or close friend can be invaluable in providing the history, clarifying the timeline or sequence of events, and to establish the patient's baseline level of function prior to the onset of acute illness.

Open-ended questions often provide a more accurate story than closed-ended questions, which tends to confirm the preconceived notions of the medical team. The time course, location, quality, and radiation of pain should be established, along with any inciting or exacerbating factors such as positioning, movement, or coughing. Changes in the location or intensity of pain are important clues.

Associated symptoms including fevers, chills, nausea, vomiting, or changes in bowel or bladder habits should be elicited. The onset and quality of the vomitus may indicate the level of obstruction, be it distal or proximal. The frequency, consistency, and color of bowel movements may indicate obstruction, inflammation, or bleeding.

The majority of elderly patients have at least one comorbid condition that complicates their acute abdominal pain, and a careful review of cardiac and respiratory symptoms may help to identify important nonsurgical causes of acute abdominal pain such as pneumonia or myocardial infarction [3, 11]. Urinary symptoms should also be elicited, and postmenopausal bleeding is always significant and concerning for malignancy.

Previous operations and their indications should be well documented. Medications should be reviewed, paying particular attention to anticoagulants, antihypertensives, NSAIDs, steroids, antimicrobials, and immunosuppressants. The majority of elderly patients are taking at least one long-term medication, and the addition of a new medication has the potential to cause adverse drug reactions. Many of these

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reactions are gastrointestinal in nature and can mimic acute intra-abdominal pathology [12, 13]. Age-appropriate cancer screening study results should be reviewed.

Important aspects of the physical exam can be obtained, while the history is taken. The overall appearance of the patient, whether ill-appearing or obvious distressed, is crucial. Observations about the patient's dress, grooming, or hygiene can be proxies for overall care access to medical attention and elder abuse. The patient's habitus and the presence of cachexia are important indicators of nutrition and the ability to withstand a surgical intervention. The quality and rate of the pulse, skin turgor, and capillary refill time can provide important clues about systemic toxicity and overall volume status. The presence of fever is important, as many elderly patients with an acute surgical disease do mount a febrile response [14].

One major contributor to difficulties in diagnosis is the high prevalence of cognitive impairment present in this patient population. Although definitions of cognitive impairment vary, 17–20 % of elderly patients have some impairment in language, visuospatial awareness, or attention that can impair the examiner's ability to elicit physical examination findings [9, 15]. Nonverbal signs of pain or tenderness such as wincing, grimacing, changes in breathing patterns, or tensing of the abdominal wall musculature take on a greater importance for patients who may not be able to communicate directly.

The sclera should be inspected for jaundice, and detection of conjunctival pallor can be a rapid way to screen for profound anemia. The mucous membranes of the face should be inspected for color and moisture. Neck masses and lymphadenopathy are important findings that can be associated with infection or malignancy.

The lung fields should be auscultated carefully to find signs of pneumonia or pleural effusions that sometimes mimic or accompany intra-abdominal pathology. The heart sounds should be auscultated carefully, as pericarditis and heart failure can both be present with abdominal pain. The flanks should be palpated and percussed for costovertebral angle tenderness as a sign of nephrolithiasis or upper urinary tract infection.

The abdomen is best examined from the patient's right side, with the patient in the supine position and arms down at the sides. Having the patient flex both knees may allow for better relaxation of the abdominal wall and less guarding. The abdomen is inspected for distention and any obvious lesions or hernias. The stigmata of liver disease such as jaundice, spider angiomas, and caput medusae should be noted. The auscultation of high-pitched bowel sounds can occasionally be helpful in cases of suspected bowel obstruction.

When examining a tender abdomen, the goal is to elicit sufficient information without causing undue pain or discomfort. Asking the patient to cough prior to palpation may

cause localized abdominal tenderness as a sign of peritoneal irritation. All four quadrants should be palpated, beginning in a quadrant away from the site of pain, and starting with gentle palpation and moving to deeper palpation as tolerated by the patient. Exquisite tenderness to percussion or light palpation signifies peritonitis, which does not need to be verified by deeper palpation. Assessing rebound in a patient when localized or generalized peritonitis has already been established is unnecessary, and only serves to distract the patient, thereby decreasing the sensitivity of other aspects of physical examination. Voluntary guarding, involuntary guarding, and "washboard" rigidity signify increasing degrees of visceral and parietal peritonitis. Obvious masses should be noted. Dullness to percussion or a palpable fluid wave signifies ascites that may be associated with liver disease, heart disease, malnutrition, or malignancy.

The digital rectal examination is a fundamental part of the evaluation and should not be omitted. The presence of rectal masses, tenderness, blood, and the presence and quality of stool in the rectal vault are all important clues.

In men, the genitalia and scrotum should be examined for hernias, torsion, and epididymitis. In women, a pelvic examination may be required to evaluate for adnexal masses, tenderness, or signs of a pelvic wall or floor hernia.

The pulse exam including palpation of extremity and abdominal pulsations is important to detect signs of vascular insufficiency and aneurysm related to mesenteric ischemia or abdominal aortic aneurysm disease as causes of acute abdominal pain. Peripheral edema can be a sign of venous occlusion or fluid overload.

Laboratory Analyses

Although laboratory analyses do not differentiate between surgical and nonsurgical causes of abdominal pain in elderly patients [16], routine evaluation should include a complete blood count, serum chemistries, liver function tests, serum amylase and/or lipase, and a urinalysis [16]. In general, most laboratory values in healthy elderly patients fall into the same reference ranges as younger patients [17–19].

The presence of leukocytosis can signify inflammation, infection, or malignancy. Hints to the chronicity and cause of anemia detected in the blood count can be found in the mean corpuscular volume, which may be microcytic in anemia of iron deficiency or chronic disease, or macrocytic in the setting of liver disease or malnutrition. Thrombocytopenia is a sensitive marker of portal hypertension.

Assessment of renal function including serum urea nitrogen (BUN) and serum creatinine is important for elderly patients with abdominal complaints. In addition to the azotemia from any fluid losses during acute illness, these patients may have underlying chronic kidney insufficiency.

Furthermore, many patients with abdominal pain will undergo intravenous iodinated contrast injection for CT scanning, and an assessment of renal function is important to stratify risk for contrast nephropathy.

Measurement of electrolytes is important for patients who have had fluid losses from vomiting or diarrhea. Elderly patients taking diuretics also have a tendency to have electrolyte abnormalities even when healthy [19]. Glucose measurement may detect hypoglycemia from lack of oral intake and compounded by hypoglycemic therapy or hyperglycemia from diabetic ketoacidosis (DKA) or hyperosmolar non-ketotic coma (HONC) as causes of nonsurgical abdominal pain. Liver function tests are useful when liver or biliary disease is suspected. The measurement of serum amylase and/or lipase is mandatory if pancreatitis is a possibility.

Although elderly patients have a high incidence of malignancy, the measurement of serum tumor markers to screen for various cancers in patients with acute abdominal pain is costly, untimely, and unlikely to provide any useful information during the initial evaluation.

Diagnostic Imaging

Ideally, an imaging test is ordered to evaluate the diagnostic hypotheses generated by the history, physical exam, and laboratory analyses. Although advances in imaging technology continue to provide greater resolution, no radiographic test provides perfect diagnostic information for abdominal pain. Instead, the clinician's must deal with probabilities and likelihoods, where the pretest probability of having a particular disease is modified by the likelihood ratio of the chosen imaging test result, which gives the posttest probability of having confirmed that particular diagnosis. Accordingly, the choice of imaging for each case depends on the performance of each imaging test to provide a high (or low) likelihood ratio in that particular situation.

The acute abdominal radiograph series is an inexpensive, widely available, and low-risk test for acute abdominal pain. Generally, this test involves acquiring an upright chest radiograph, an upright abdominal radiograph, and a supine abdominal radiograph. If the patient cannot tolerate standing upright, then a lateral decubitus or supine cross-table radiograph may be substituted. The chest radiograph can evaluate for acute cardiopulmonary disease such as pneumonia but, more importantly, is considered the most sensitive plain radiograph for the detection of pneumoperitoneum, i.e., free air. While plain abdominal radiographs may demonstrate foreign bodies and bowel obstruction as well as evidence of volvulus, bowel ischemia, and stones, they are generally insensitive for diagnosing acute abdominal pathology [20].

Abdominal ultrasound continues to be the test of choice for evaluating right upper quadrant pain [21, 22]. Although this modality is somewhat dependent on operator skill and experience, ultrasound is a sensitive test for evaluating for gallstones and acute cholecystitis. While elderly patients do tend to have larger caliber extrahepatic bile ducts on ultrasound, the vast majority of elderly patients without biliary disease have calibers below 6–7 mm, the generally accepted upper range of normal [23, 24]. Abdominal ultrasound can also demonstrate perinephric fluid collections or hydronephrosis associated with urinary tract pathology. The use of abdominal ultrasonography in the diagnosis of acute appendicitis in adults is controversial, and further study is needed, especially in the elderly population. Ultrasound is very accurate in the diagnosis of abdominal aortic aneurysms [25].

In elderly female patients with pelvic complaints, transvaginal ultrasound is an efficient modality that does not involve contrast injection or ionizing radiation. Although diagnoses such as ectopic pregnancy and pelvic inflammatory disease are not concerns in the elderly population, transvaginal ultrasound is sensitive for the detection of endometrial cancer and adnexal masses, both benign and malignant [26, 27].

Computed tomography (CT) scanning is relatively fast, widely available, and has been shown to be helpful in the diagnosis of a wide variety of diseases in patients with acute abdominal pain [28]. In elderly patients with acute abdominal pain where accurate diagnosis can be challenging, CT has been shown to alter clinical decision making in a significant portion of cases [29]. CT also provides spatial anatomic information that may be useful to surgeons or other interventionalists. CT does require exposure to ionizing radiation and the risk for the induction of malignancy, although this risk is lower for older patients whose postexposure lifetimes are generally shorter. Although non-contrast CT scans do provide some diagnostic information, the utility of CT is greatly augmented by the administration of intravenous radiocontrast during the examination. Kidney injury from contrast administration continues to be an important complication of CT examinations and advanced age has been associated with increased risk, independent of other known risk factors such as renal insufficiency, diabetes mellitus, and cardiovascular disease [30]. Therefore, before intravenous contrast is given, the potential benefit of the examination should be assessed along with the risk of contrast nephropathy and the possible need for incorporation of prevention strategies.

Although magnetic resonance imaging (MRI) has been found to be accurate in the diagnosis of acute appendicitis, diverticulitis, acute cholecystitis, and acute pancreatitis [31], it is not widely available, and utility of MR in acute abdominal pain is limited by lengthy examination times and higher cost compared to CT.

Differential Diagnosis

When caring for a patient with acute abdominal pain, the most important question is whether or not the patient requires an urgent operation. If hemodynamic instability, generalized peritonitis, or clinical deterioration is present, the safest course of action is often to proceed directly to the operating room or surgical intensive care unit under the care of a surgical team. With few exceptions, if a patient presents in extremis with acute abdominal pain, they suffer from one of a few catastrophes: ruptured abdominal aortic aneurysm, severe pancreatitis, bowel infarction, or sepsis from some uncontrolled source of infection such as cholangitis or urosepsis. In this situation, information is often limited, and the task is to determine rapidly the most likely cause and proceed as quickly as possible with stabilization and definitive treatment. In this situation, further efforts to diagnose the patient more accurately or thoroughly in the emergency department serve only to delay the potentially life-saving intervention that is required.

If the patient with acute abdominal pain is hemodynamically stable and peritonitis is absent, then there is time to review all relevant clinical information and develop a differential diagnosis. Here, the location and nature of pain are particularly helpful. In general, the differential for acute abdominal pain in the elderly patient will not differ significantly from that of a younger patient, although certain diagnoses such as ectopic pregnancy are not encountered in elderly patients.

In comparison to generalized peritonitis where late-stage inflammation is usually related to a perforated hollow viscus, the cardinal presentation of localized pain and tenderness provides some information about which viscera is diseased. Furthermore, observational studies of elderly patients presenting with acute abdominal pain have described the most common diagnoses in this cohort [4, 6, 11, 32–34]. Among causes of right upper quadrant pain and tenderness, biliary colic, acute cholecystitis, and cholangitis are most common. Right lower quadrant findings suggest acute appendicitis or an unusual presentation of diverticulitis. Left lower quadrant pain and tenderness would be a more usual presentation of diverticulitis. Epigastric pain and tenderness invoke peptic ulcer disease or pancreatitis. Suprapubic or flank findings suggest a urinary source such as infection or stone disease, which are both quite common in the elderly population [6].

The cardinal presentation of distention, nausea, and vomiting suggests bowel obstruction. When accompanied by colicky pain, small bowel obstruction would be most common, due to incarcerated hernia, adhesions, or malignancy [32, 33]. When distention is more prominent than pain, large bowel obstruction from diverticular disease, malignancy, volvulus, or constipation are most common [32, 33].

Given the higher rates of malignancy for elderly patients and the significant rates of malignancy in elderly patients presenting with abdominal pain cancer should always be considered as a possibility [11, 32, 34].

Important nonsurgical causes of abdominal pain include myocardial infarction, pulmonary embolism, pneumonia, toxic ingestion, and drug or alcohol withdrawal.

Pitfalls

The term “nonspecific abdominal pain” should be used with caution. Especially in the elderly patient, the absence of a diagnosis does not indicate that a life-threatening process does not exist. Important causes of abdominal pain tend to progress with time, and a period of observation is prudent for any elderly patient who presents with acute abdominal pain. The observation period allows for the integration of serial physical examinations and follow-up laboratory or imaging data either to make an accurate diagnosis or to decide that the patient requires an urgent intervention.

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