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Review Article

Severe Abdominal Pain Management in Emergency Room

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Abstract

Background: Acute abdomen is characterized as a rapid onset of intense abdominal pain within a brief period of time. It has a large number of potential triggers and a systematic solution is therefore required. Abdominal discomfort is the most frequent cause for an emergency department visit, accounting for around 5% to 10% of all ED visits.

Aim: In this review, we will look into the epidemiology, causes, diagnosis and initial management of acute abdomen in emergency room.

Conclusion: Abdominal pain is the most frequent cause acute pain cause in emergency departments. Acute abdomen involves several intra-abdominal cases that require rapid intervention for accurate diagnosis and treatment. Unmanaged pain affects patient comfort and impairs the body systems and may be fatal in some urgent cases. Rapid, appropriate assessment of pain cause and proper resuscitative therapy are obligatory.

Keywords: *Emergency Management of Acute Abdomen; Acute Abdominal Pain in Emergency Room; Causes of Acute Abdomen; Diagnosis of Acute Abdomen*

Introduction

Acute abdomen is characterized as a rapid onset of intense abdominal pain within a brief period of time. It has a large number of potential triggers and a systematic solution is therefore required. Abdominal discomfort is the most frequent cause for an emergency department visit, accounting for around 5% to 10% of all ED visits [1]. Acute abdomen poses a diagnostic problem for the emergency doctor as the causes are several from life-threatening conditions to benign conditions. Many factors can affect clinical findings which can

lead to incorrect diagnosis and false case management [2]. Abdominal pain presents a challenging issue for both general and pediatric EM physicians as almost 25% of patients usually present with a non-specific cause. Latest radiological imaging advances play a major rule in defining cause of this pain [3].

Symptoms primarily include extreme abdominal pain. Fever, constipation, bloody stools, rebounding abdominal tenderness, abdominal weakness and defending, bloating, jaundice, colic and migration pain can also occur [1].

Common causes of an acute abdomen include gastro-intestinal as pancreatitis, diverticulitis, obstruction or acute peritonitis which can result from rupture of a hollow viscus or as a complication of inflammatory bowel disease or malignancy [4]. Vascular causes include mesenteric ischemia and ruptured abdominal aortic aneurysm. Urologic conditions including ureteral colic and pyelonephritis can also present as acute abdominal pain. Obstetric and gynecologic causes include ruptured ectopic pregnancy and ovarian torsion [5]. Other causes may include infection or inflammation. There are also several medical problems that can cause acute abdominal pain that need medical attention as sickle cell anemia, diabetic ketoacidosis, adrenal crisis, and pyelonephritis [6]. Non-specific abdominal pain (22.0 - 44.3%), acute appendicitis (15.9 - 28.1%), biliary disease (2.9 - 14.0%), gastrointestinal perforation (2.3 - 15.0%), adynamic ileus (4.1 - 8.6%), diverticulitis (8.2 - 9.0%), pancreatitis (3.2 - 4.0%), ureteral colic (5.1%) and inflammatory bowel diseases (0.6%) are the most frequent causes of acute abdominal pain seen in the ER [7].

Emergency physicians must be qualified in the treatment of abdominal pain. Although a common presentation, abdominal pain must be approached in a serious manner, as it is often a symptom of serious disease and misdiagnosis may occur. A surgeon must see all patients presenting to ER with acute abdomen [8].

Approach of an emergency abdominal patient may include a detailed history and physical exam. Quick, effective research and consequent resurrection therapy are mandatory [9]. If the situation is also surgical, early consultation with a specialist is necessary. The origin of the pain is important as it can signify a localized mechanism. History and physical assessment are used to remove some of the diagnoses and recommend others. Emergency care doctors are well aware of the way in which these illness entities are treated [10].

In this review, we will look into the epidemiology, causes, diagnosis and initial management of acute abdomen in emergency room.

Epidemiology

There have been no significant numbers of acute abdomen cases but many previous studies reported cases between 7% and 10% of total emergency department visits are for abdominal pain. Abdominal pain of unknown cause remains the diagnosis for approximately one quarter of patients discharged from the ED and between 35% and 41% for patients referred in the hospital [1,11]. In USA, during period of 2000 to 2010, approximately 45.4% of ED visits were caused by primary symptom or diagnosis of pain. In other studies: the percentage of visits as acute abdomen patient-reported symptom continued stable and consistently represented approximately 45% of ED visits. 40% of patients report pain as primary reason and 20% of doctors reported a primary diagnosis of pain [12].

Differential diagnosis

Life threatening causes like abdominal mesenteric ischemia, aortic aneurysm, perforation of gastrointestinal tract like peptic ulcer, bowel, esophagus, or appendix, acute bowel obstruction, ectopic pregnancy, volvulus, placental abruption, splenic rupture or myocardial infarction [13].

Aneurysm rupture causes hemorrhage and unstable hypotension. It can also present with back pain and hematuria which may lead to potential misdiagnosis as nephrolithiasis [14]. Majority of patients with bowel obstructions involve small intestine with other symptoms as abdominal distention, vomiting, crampy abdominal pain, and absence of flatus [15]. Atypical presentation of myocardial infarction may also present with abdominal pain which is most common in women older than 65 years of age [16].

Sudden pain combined with few abdominal symptoms and strong bowel movements in a risk factor patient can significantly increase concern of mesenteric ischemia [17]. Perforation must be assumed in individuals with a history of peptic ulcer signs with abrupt onset of extreme, diffuse abdominal pain. Perforation is more common and fatal to the elderly [18].

Physicians should suggest the condition of ectopic pregnancy in any woman of reproductive age with abdominal pain and should provide a human chorionic gonadotropin testing in all such patients. Although the signs of ectopic pregnancy usually include amenorrhea triad, stomach pain, and genital bleeding, up to 30% of patients do not experience vaginal bleeding [19].

There are other common but not life-threatening conditions as appendicitis which is the most common extra-uterine cause for abdominal pain in non-pregnant women [20]. Nausea and vomiting are generally not the first symptoms. Peptic ulcer disease present with epigastric pain, indigestion, and reflux symptoms, but none is sensitive or specific [21]. Patients diagnosed cholecystitis normally report abdominal pain and development to septic shock may happen with ascending cholangitis [22]. Acute pancreatitis is nearly invariably present with acute upper abdominal pain that exceeds full severity within 20 minutes of onset but can continue for days where nausea and vomiting are common [23]. Gastroenteritis is a common diagnosis of exclusion in the ED, where the clinician must focus on life-threatening causes of abdominal pain [24].

Urinary infections or lower urinary tract infections may also induce acute abdominal, and frequently show a suprapubic pain coupled with urinary symptoms such as incidence, urgency or dysuria [25]. Pelvic inflammatory diseases cause abnormal uterine bleeding, new vaginal discharge, urethritis and fever [26]. Endometriosis with typical symptoms has been one of the triggers of pelvic pain, dysmenorrhea, miscarriage, and deep dyspareunia. The test is sometimes unnoticeable. DKA may have extreme stomach pain and vomiting. Pulmonary embolus may manifest with a variety of non-specific symptoms and signs that could include upper abdominal pain and shoulder pain [27]. Toxin and absorption of certain medications may cause pain in the abdomen. Toxic shock syndrome characterized by fever, rash, hypotension and impact of various organs. Neoplasm can also cause abdominal pain as well as ovarian cancer which also present with swelling, dyspepsia, indigestion, abdominal distention, flatulence, anorexia, pelvic pressure, back pain, rectal fullness, or urinary urgency, or frequency. Colorectal cancer can present with abdominal pain with changes in bowel habits, weight loss, and rectal bleeding [28,29].

Pain caused through trauma cannot appear until days or weeks following the incident. Splenic rupture is a typical example, but late diagnosis of perforated intestine, pancreatitis, and liver, gallbladder and genitourinary tract injury may lead to further complications and maybe death. It is also necessary to question patients presenting an ED with abdominal pain about current and previous trauma [30].

Diagnostic approach

History and physical assessment was used to remove some of the diagnoses and recommend others. ER doctors should strive to get as comprehensive a history as possible, as this is usually the foundation of an effective diagnosis. A full explanation of the patient's suffering and symptoms associated should be included in the history [31]. Health, surgical and social records should also be pursued, as it can provide valuable details. Acute-onset pain, particularly if serious, should give rise to urgent concern about a possible intra-abdominal tragedy [32].

Physicians should aim to differentiate between mild, improperly localized, pain or gnawing pain caused by viscerally innervated organs as opposed to distinctively "sharp," more specified and localized somatic pain caused by inflammation of the parietal peritoneum or other somatically innervated structures [33].

Severity of discomfort should be measured. Assessment of patients with intense abdominal pain must be performed quickly and critically to determine pain severity in order to direct effective pain treatment [34]. Extreme pain may also raise the concern about a severe underlying cause; however, reports of milder pain cannot be counted on to rule out medical condition, particularly in older patients who may under-report signs [35].

Checking if anything worsens the pain and anything improves the pain such as coughing or walking aggravates the pain. Simple and repeatable pain measurements using one-dimensional and multi-dimensional scales have been developed for objective assessment of individual pain perception [37]. One-dimensional scales such as the visual analogue scale (VAS), verbal rating scale (VRS) and numerical rating scale (NRS), as well as the 'Smiley analogue scale' (SAS) are used in the acute setting [38].

Specific ways of development can be diagnosed, such as pain displacement in appendicitis, at which main distention of the appendix triggers periumbilical visceral pain that transfers to the lower right quadrant after the inflammatory phase is observed by the parietal peritoneum somatic sensors [39].

It is necessary to mention fever and cardiopulmonary signs. Related signs should be put in the therapeutic sense, such as the age of the patient and the present state of the disease [40].

Pre-diagnostic analgesia in people with acute abdominal pain obfuscates physiological signs and has a bad influence on care decisions. Patients may undergo insufficient pain management due to communication issues, fears about analgesic adverse effects and crowding of patients with ERs. Pre-diagnostic administering of analgesia in abdominal pain is validated by published evidence-based literature [41].

First the general appearance of the patient is observed. Patient with abdominal pain is still of particular concern considering the number of potentially fatal true causes. Vital signs of anomalies may alert the clinician to a severe source of abdominal pain. The emergency doctor must know the main aspects of the abdominal examination while acknowledging the drawbacks of it [42]. The ED abdominal examination focuses mainly on the site of tenderness, the diagnosis of peritonitis and the detection of such enlargements, such as abdominal aorta. Localized tenderness is normally a reliable reference to the actual source of the discomfort [43]. More widespread tenderness is a major diagnostic problem. Given known difficulties with the diagnosis of appendicitis in elderly persons, nearly all of them will have the right lower quadrant tenderness [44].

There are a number of examination techniques that may be useful to the emergency physician in helping to establish a diagnosis as carnett's sign, cough test, closed eyes sign, murphy's sign, the psoas sign, the obturator sign, and the rovsing sign [45]. Cough test is an indirect test where doctor can look for signs of pain such as flinching, grimacing, or moving the hands to the abdomen during coughing has 79% similar sensitivity [46]. Rectal examination provides limited medical utility for treating acute abdominal pain; however, it can be used to diagnose intestinal ischemia, late intussusception, or colon cancer [47].

Emergency management of pain

Acute abdominal pain management in ER involves various factors, such as quick initial evaluation of pain level, effective route administration of the appropriate analgesic drug, and early introduction of adjuvant interventions, which should be replicated for ongoing pain evaluations to guide further analgesia [48]. Conclusive management may rely on a preliminary diagnosis. Senior recommendation or referral to a facility center should be treated on the grounds of clinical diagnosis and seriousness [49].

Sufficient opiate pain relief is a quality of treatment. Non-opioid and opioid analgesics with different modes of administration are readily accessible. In all therapeutic cases, the path of delivery of the analgesic agent must be calculated in relation to the approximate propensity for enteric absorption of the administered agent [50]. The use of anti-emetics is equally significant. In situations with acute abdominal pain accused of undermining enteric absorption, intravenous analgesic administration can be done in order to circumvent the gastrointestinal tract and achieve accelerated onset of operation [51]. Each prescription opioid has a distinct analgesic efficacy and side effect profile that impacts the dosing and clinical indications of the device. Extreme acute abdominal pain requires a strong-acting antibiotic, such as morphine. Tramadol and tilidine or other weak opioid are not considered as first-line agents in the management of acute abdominal pain, given that they have a well-recognized maximum daily dosage with attendant short duration of effect [52,53].

Non-opioid analgesics available commercially, paracetamol and dipyrone could be given parenterally at a fast onset of operation, making them the two recommended non-opioid analgesics in patients with severe abdominal pain [54]. Non-opioid combinations, especially NSAIDs and paracetamol, remain unknown. When a medical emergency is assumed on the grounds of appearance or physical results, an emerging surgeon may be contacted. The surgeon must be consulted before a potentially time-consuming procedure is conducted [55].

Broad-spectrum antibiotics should be delivered in a timely manner where inflammation, peritoneal soiling, or sepsis is differential. Patients who are ill should be watched for continued vital signs of resurrection. Hypotension and tachycardia indicate a lack of blood, hypovolemia, or sepsis and involve prompt, vigorous resuscitation of the fluid with sufficient large bore IV access [56].

Conclusion

Abdominal pain is the most frequent cause acute pain cause in emergency departments. Acute abdomen involves several intra-abdominal cases that require rapid intervention for accurate diagnosis and treatment. Unmanaged pain affects patient comfort and impairs the body systems and may be fatal in some urgent cases. Rapid, appropriate assessment of pain cause and proper resuscitative therapy are obligatory.

Bibliography

1. Kamin RA., *et al*. "Pearls and Pitfalls in the Emergency Department Evaluation of Abdominal Pain". *Emergency Medicine Clinics of North America* 21 (2003): 61-72.

2. Pitts SR., *et al*. "National hospital ambulatory medical care survey: 2006 emergency department summary". National health statistics report; no 7. Hyattsville, MD: National Center for Health Statistics (2008).

3. Macaluso CR and McNamara RM. "Evaluation and management of acute abdominal pain in the emergency department". *International Journal of General Medicine* 5 (2012): 789-797.

4. Kaushal-Deep SM., *et al*. "Primary cecal pathologies presenting as acute abdomen and critical appraisal of their current management strategies in emergency settings with review of literature". *International Journal of Critical Illness and Injury Science* 8.2 (2018): 90-99.

5. Maleki Verki M and Motamed H. "Rectus Muscle Hematoma as a Rare Differential Diagnosis of Acute Abdomen; a Case Report". *Emergency* 6.1 (2018): e28.

6. Agboola JO., *et al*. "Pattern and Presentation of Acute Abdomen in a Nigerian Teaching Hospital". *Nigerian Medical Journal* 55 (2014): 266-270.

7. Strömberg C., *et al*. "Acute abdominal pain: Diagnostic impact of immediate CT scanning". *World Journal of Surgery* 31 (2007): 2347-2354.

8. Elhardello OA and MacFie J. "Digital rectal examination in patients with acute abdominal pain". *Emergency Medicine Journal* 35.9 (2018): 579-580.

9. Selbst SM., *et al*. "Epidemiology and etiology of malpractice lawsuits involving children in US emergency departments and urgent care centers". *Pediatric Emergency Care* 21 (2005): 165-169.

10. Kachalia A., *et al*. "Missed and delayed diagnoses in the emergency department: a study of closed malpractice claims from 4 liability insurers". *Academic Emergency Medicine* 49 (2007): 196-205.

11. Kamin RA., *et al*. "Pearls and pitfalls in the emergency department evaluation of abdominal pain". *Emergency Medicine Clinics of North America* 21.1 (2003): 61.

12. Chang HY., *et al*. "Prevalence and treatment of pain in EDs in the United States, 2000 to 2010". *The American Journal of Emergency Medicine* 32.5 (2014): 421-431.

13. Godshall D., *et al*. "Gastric volvulus: case report and review of the literature". *The Journal of Emergency Medicine* 17 (1999): 837-840.

14. Marston WA., *et al*. "Misdiagnosis of ruptured abdominal aortic aneurysms". *Journal of Vascular Surgery* 16 (1992): 17.

15. Luber SD., *et al*. "Care of the bariatric surgery patient in the emergency department". *The Journal of Emergency Medicine* 34 (2008): 13.

16. Sinha P and Kuruba N. "Ante-partum haemorrhage: an update". *Journal of Obstetrics and Gynaecology* 28 (2008): 377.

17. Inderbitzi R., *et al*. "Acute mesenteric ischaemia". *European Journal of Surgery* 158 (1992): 123-126.

18. Chen EH., *et al*. "Derivation of a clinical prediction rule for evaluating patients with abdominal pain and diarrhea". *American Journal of Emergency Medicine* 26.4 (2008): 450-453.

19. Edwards ED., *et al*. "Presentation and management of common post-weight loss surgery problems in the emergency department". *Annals of Emergency Medicine* 47 (2006): 160.

20. Brewer RJ., *et al*. "Abdominal pain: an analysis of 1,000 consecutive cases in a university hospital emergency room". *The American Journal of Surgery* 131 (1976): 219-224.

21. Schafermeyer RW. "Pediatric abdominal emergencies". In: Tintinalli JE, Kelen GD, Stapczynski S, *et al*. editors. Emergency Medicine: a Comprehensive Study Guide. 6th edition. New York: McGraw-Hill (2004): 844-851.

22. Greenlee HB., *et al*. "Acute large bowel obstruction. Comparison of county, Veterans Administration, and community hospital populations". *Archives of Surgery* 108 (1974): 470-476.

23. Hadjis NS., *et al*. "Acute abdominal pain and the urge to defecate in the young and old: a useful symptom complex?" *The Journal of Emergency Medicine* 17 (1999): 239-242.

24. Jess P., *et al*. "Prognosis of acute nonspecific abdominal pain. A prospective study". *The American Journal of Surgery* 144 (1982): 338.

25. Lukens TW., *et al*. "The natural history and clinical findings in undifferentiated abdominal pain". *Annals of Emergency Medicine* 22 (1993): 690.

26. Kamin RA., *et al*. "Pearls and pitfalls in the emergency department evaluation of abdominal pain". *Emergency Medicine Clinics of North America* 21 (2003): 61.

27. Lewis LM., *et al*. "Etiology and clinical course of abdominal pain in senior patients: a prospective, multicenter study". *The Journals of Gerontology Series A Biological Sciences* 60 (2005): 1071.

28. Yamamoto W., *et al*. "The relationship between abdominal pain regions and specific diseases: an epidemiologic approach to clinical practice". *Journal of Epidemiology* 7 (1997): 27.

29. Purcell TB. "Nonsurgical and extraperitoneal causes of abdominal pain". *Emergency Medicine Clinics of North America* 7 (1989): 721.

30. Staniland JR., *et al*. "Clinical presentation of acute abdomen: study of 600 patients". *British Medical Journal* 3 (1972): 393.

31. Jung PJ and Merrell RC. "Acute abdomen". *Gastroenterology Clinics of North America* 17 (1988): 227-244.

32. Jones RS and Claridge JA. "Acute abdomen". In: Townsend CM, Beauchamp RD, Evers BM., *et al*. editors. Sabiston Textbook of Surgery: the Biologic basis of Modern Surgical Practice. 17th ed. Philadelphia: Elsevier (2004): 1219-1238.

33. Abbott J. "Pelvic pain: lessons from anatomy and physiology". *The Journal of Emergency Medicine* 8 (1990): 441-447.

34. Feinstein B., *et al*. "Experiments on pain referred from deep somatic tissues". *Journal of Bone and Joint Surgery American* 36 (1954): 981-997.

35. Silen W. "Cope's Early Diagnosis of the Acute Abdomen". New York: Oxford; 2010. Cholecystitis and other causes of acute pain in the right upper quadrant of the abdomen (2010): 131-140.

36. Giamberardino MA., *et al*. "Modulation of pain and hyperalgesia from the urinary tract by algogenic conditions of the reproductive organs in women". *Neuroscience Letter* 304.1-2 (2001): 61-64.

37. Fenyo G. "Acute abdominal disease in the elderly: experience from two series in Stockholm". *The American Journal of Surgery* 143 (1982): 751-754.

38. Anderson JR and Lee D. "The management of acute sigmoid volvulus". *British Journal of Surgery* 68 (1981): 117-120.

39. Silen W. "Cope's Early Diagnosis of the Acute Abdomen". New York: Oxford. Method of diagnosis: the history (2010): 18-27.

40. Hickey MS., *et al*. "Evaluation of abdominal pain". *Emergency Medicine Clinics of North America* 7 (1989): 437-452.

41. Prout WG. "The significance of rebound tenderness in the acute abdomen". *British Journal of Surgery* 57 (1970): 508-510.

42. Markle GB. "Heel-drop jarring test for appendicitis". *Archives of Surgery* 120 (1985): 243.

43. Brewster GS and Herbert ME. "Medical myth: a digital rectal examination should be performed on all individuals with suspected appendicitis". *Western Journal of Medicine* 173 (2000): 207-208.

44. Liddington MI and Thomson WHF. "Rebound tenderness test". *British Journal of Surgery* 78 (1991): 795-796.

45. Bennett DH., *et al*. "Use of coughing test to diagnose peritonitis". *British Medical Journal* 308 (1994): 1336.

46. Jesudason EC and Walker J. "Rectal examination in paediatric surgical practice". *British Journal of Surgery* 86 (1999): 376-378.

47. Thomson H and Francis DMA. "Abdominal-wall tenderness: a useful sign in the acute abdomen". *Lancet* 2 (1977): 1053-1054.

48. Brune K and Zeilhofer HU. "Antipyretic (non-narcotic) analgesics". In Textbook of Pain, 4th edition, P.D. Wall, R. Melzack, eds. (Edinburgh: Churchill Livingstone) (1999): 1139-1153.

49. Carr DB and Goudas LC. "Acute pain". *Lancet* 353 (1999): 2051-2058.

50. Brownfield E. "Making Health Care Safer: a critical analysis of patient safety practices. Evidence Report/Technology Assessment, No 43. AHRQ Publication No 01-E058. Rockville (MD): Agency for Healthcare Research and Quality; 2001. Pain management. Use of analgesics in the acute abdomen (2001): 396-400.

51. Silen W. "Cope's Early Diagnosis of the Acute Abdomen". New York: Oxford. Principles of diagnosis in acute abdominal disease (2010): 3-17.

52. Thomas SH., *et al*. "Effects of morphine analgesia on diagnostic accuracy in emergency department patients with abdominal pain: a prospective, randomized trial". *Journal of the American College of Surgeons* 196 (2003): 18-31.

53. Abu-Kishk I., *et al*. "Transient renal insufficiency following dipyrone overdose". *Archives of Disease in Childhood* 95 (2010): 233-234.

54. Amoli HA., *et al*. "Morphine analgesia in patients with acute appendicitis: A randomised double-blind clinical trial". *Emergency Medicine Journal* 25 (2008): 586-589.

55. Bannwarth B and Péhourcq F. "[Pharmacologic basis for using paracetamol: Pharmacokinetic and pharmacodynamic issues]". *Drugs* 63.2 (2003): 5-13.

56. Macaluso CR and McNamara RM. "Evaluation and management of acute abdominal pain in the emergency department". *International Journal of General Medicine* 5 (2012): 789-797.

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