

SYSTEMATIC REVIEW AND ANALYSIS OF THE DIAGNOSTIC ACCURACY OF ULTRASOUND VERSUS COMPUTED TOMOGRAPHY IN ACUTE ABDOMINAL PAIN

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Abstract: The cases coming in Hospital's emergency usually belong to acute pain in the abdominal (AAP). The doctors on duty in emergency wards often facing problem to make diagnosis just on basis of the patient's history. The choice of diagnostic (imaging) modality is very important in this scenario to save time and hence, patient's life. This investigation was made to demonstrate the precision of imaging modalities in acute pain of abdomen. **Objective:** To assess the demonstrative precision of ultrasound versus tomograph in intense midriff torment. **Methodology:** A total of 35 articles fulfilling the selection criteria and published between 2002-2014 were included for this systematic review. These articles retrieved from Medline, Embase, Cochrane Library, CINAHL and Google. The search criteria of this study based on eleven imaging modalities. **RESULT:** The investigation was performed on 5042 AAP with age 48.5 ± 5 years, 49.5 % females and 51.5 % males. A total of 2054 patients had inflammation of appendix while 1764 and 1224 had inflammation in diverticulum and gallbladder. True positive rate of CT in recognizing an infected appendix was 93% ($p < 0.01$) and of diverticulum was 74% ($p = 0.049$) that was altogether higher than that of ultrasound. For cholecystitis, true positive rate of both CT versus US was almost same: 74 % ($p > 0.052.00$). Ultrasound true positive rate in recognizing an infected appendix and diverticulum was not appreciably influenced by patient's age/gender and experience of evaluators. **Conclusion:** The computed tomograph misses less than ultrasound the cases of intense midriff torment.

Key words: Acute pain of abdomen, ultrasound, computed tomography, cholecystitis, diverticulitis, appendicitis, perforated viscus, acute peritonitis, hernia.

INTRODUCTION

Roughly 5-10 percent of cases coming in Hospital's emergency usually are of acute pain in abdominal and identified with inflammation of appendix, diverticulum and gall bladder other significant, however less common conditions that may cause such acute pain are of perforated abdominal viscera and gut ischemia.¹ The clinical appearances of the ailments for this pain are not usually straightforward. For appropriate treatment, the diagnostic imaging that empower the clinician to make definite diagnosis of the different causes for such pain are decisive.² Therefore, the imaging techniques are generally employed as a part of the work-up of these cases.³ Ultrasound and computed tomograph are both frequently used in health and medical research centers for identification of ailments of these patients. The American College of Radiology (ACR) recommends computed tomograph for diagnosis of such acute pain while other authorities of radiology are supportive of ultrasound as the essential imaging system mostly on the grounds that ultrasound is cost effective and does not introduce ionizing radiations and is ideal than X-beams⁴. Intense

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Abdominal Pain can be analyzed on MRI and Conventional Radiograph but however MRI is not accessible in routine hospital's emergency and recommended by ACR suggestions.

Usually researchers choose "Ultrasound or Computed tomograph" in these circumstances to diagnose ailments of AAP.^{5,6}

The purpose for the present investigation was to show the near analytic exactness of ultrasonograph and C.T to figure out which one is best modality to decide the most conceivable reason for acute pain in abdomen.^{7,8}

Methods:

Preapproval was obtained from the institutional review board (IRB) and ethical committee.

The 35 articles of of Medline, Embase, Cochrane Library, Cinahl and Google were shortlisted for this study. Acute Abdominal Pain", "Ultrasound", "Computed tomography", "Cholecystitis' Diverticulitis", "Appendicitis", "Perforated viscus", "Acute peritonitis" and "Hernia" phrases were used as keywords for selection of relevant articles. The duration of the selected articles ranged from 2002-2014. Only articles in English language were retrieved. Total 5042 cases were analysed during the present study^{9,10}.

Eleven imaging modalities were followed in the present study.

The diagnostic protocol of these modalities were

1. Clinical diagnosis;

Single test strategies

2. Clinical diagnosis after plain skiagrams;
3. Ultrasonograph in all patients ;
4. Computed tomograph in patients; if ultrasonograph was not helpful;

Conditional strategies

5. CT, if ultrasonograph was uncertain;
6. CT for patient of age 45 or more years but Ultrasonograph for patients of age less than 45 years.

Strategies driven by patients' characteristics

7. C.T. for negative or uncertain Ultrasonograph of patient having age less than 45 years
8. CT for patient of body mass index more or equal³⁰. Ultrasonograph for patients having body mass index less than 30, C.T. for negative or uncertain ultrasonograph cases of body mass index less than 30.
9. Ultrasonograph for cases of age less than 45 years. CT for ultrasonograph not helpful or uncertain cases of body mass index less than 30 or age less than 45 years.

Strategies driven by location of pain

10. Ultrasonograph for cases having tenderness in right cephalic abdominal quadrant but C.T If tenderness is in right caudal abdominal quadrant.
11. C.T for cases having tenderness in left caudal or left cephalic abdominal quadrant and also for diffuse tenderness cases.

Bar chart (Fig.1) is drawn for comparative sensitivity and specificity values of 11 imaging methodologies.

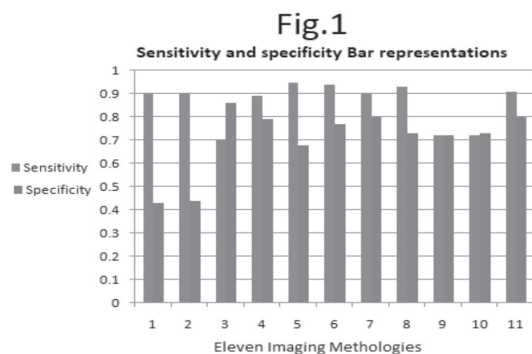


Fig-1.

RESULT:

Out of 5042, 3731 (74%) cases had been assessed by surgical trainees and 1311 (26%) cases by a radiological trainee.

Urgent and non-urgent cases of this study (Table.1.) indicated:

- The highest cases were of an infected appendix and second serious diverticulitis.
- Total dire cases were 3445 (68%) and Total non-critical diagnoses 1597 (32%).
- A high true positive rate and deficient true negative rate for critical cases was found by the C.T with or without ultrasound.
- The 5 percent increase in true positive rate and 5 percent decrease of true negative cases occur, when changing from a general to a conditional computed tomograph methodology.
- The statistical significance value of relative urgent cases of appendicitis was ($P = 0.008$).
- The utilization of ultrasound scan in cases matched with the clinical analysis decreased the numbers of fake positive critical determinations.
- The estimations of ultrasound versus computed tomograph indicated that computed tomograph as a superior lonely

test (computed tomograph procedure) for the identification of critical conditions than Ultrasound scan as the affectability was fundamentally higher for computed tomograph (90%) than for ultrasound scan (70 % , P lesser than 0.001).^{21, 22}

Table .1. Diagnosis in 5042 Cases

Urgent cases			
Diagnosis	Patients Number (%)	Diagnosis	Patients number (%)
Acute appendicitis	1465 (29)	Acute diverticulitis	655 (13)
Bowel obstruction	405 (8)	Acute cholecystitis	255 (5)
Acute pan-creatitis	200 (4)	Gynaecolog-ical diseases	150 (3)
Urological diseases	50 (1)	Perforated viscus	50 (1)
Abscess	50 (1)	Pneumonia	50 (1)
Bowel isch-aemia	50 (1)	Acute perito-nitis	15 (0.3)
Retroper-itoneal or abdominal wall bleeding	50 (1)		
Total urgent cases		3445 (68%)	
Non-urgent cases			
Non-specific abdominal pain	860 (17)	Gastrointes-tinal diseases	200 (4)
Hepatic, pancreatic, and biliary diseases	150 (3)	Inflammatory bowel dis-ease	150 (3)
Urological diseases	100 (2)	Gynaecolog-ical diseases	50 (1)
Malignancy	25 (0.5)	Hernia	12 (0.2)
Other	50 (1)		
Total non-urgent diagnoses		1597 (32%)	

DISCUSSION

The true positive rate i.e sensitivity and a high affectability of abdominal pain indicate critical conditions, which are essential to treat or operate such cases promptly to save their lives. False positive cases of critical condition, if determine in time, it helps to avoid over-treatment.^{31,32} This investigational study indicate that the Clinical analysis or Ultrasonograph alone overlook number of cases of high sensitivity & affectability so it is not possible to decide the accurate diagnosis on basis of them alone.^{33,34} However Computed tomograph limits these ignored cases of high sensitivity & affectability. "Roughly the 5 percent increase in true positive rate and 5 percent decrease of true negative cases is also seen, when changing from a general to a conditional computed tomograph methodology.³⁵ These discoveries assessed by present study match imaging research work performed by a number analysts like Broder et.al Emergency radiology. 2006) 4; Dhillon et.al. (ClinRadiol 2002)³⁴

There were a few potential impediments of 11 imaging modalities like "the research outline only after its full analytic findings in all selected cases; and management of cases depend on the finding of each and every 11 imaging methodologies.^{19,20} Most cases were referred to the outdoor by medical practioners, were sent back from outdoor without imaging & this brought about a moderately high slipping of cases of critical condition.^{21,22} It is a generally accepted fact the precision of investigation relies upon evaluator's understanding and experience. Trainee in surgery and radiology mostly involved in this present investigational research did not account this factor.^{23,24}

Conclusion:

The C.T. misses less than ultrasound the cases of intense midriff, however both ultrasound and computed tomograph can dependably identify similar ailments causing intense midriff torment. Ultrasound true positive rate was not appreciably influenced by patient's age/gender and experience of evaluator.

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