Research Article

Role of abdominal Ultrasonography in diagnosis of acute abdomen

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Abstract

Introduction: Ultrasonography has established itself as an invaluable tool in surgery. In surgical practice, abdominal pain is perhaps the most common symptom encountered and almost in every case of abdominal pain surgeon prefers to use the ultrasound to confirm the diagnosis. Although physical examination of the patient is the most important part in proper diagnosis many a time some positive help is required in the form of investigations especially ultrasonography. **Methods**: This was a study of hundred patients carried out at a tertiary care hospital admitted with complaints of severe abdominal pain except those with a history of trauma or with a history of chronic abdominal pain. Clinical history, physical examination, ultrasonography, per operative findings and histo-pathological examination were used to come to a final conclusion. **Result:** In this study ultrasonography was diagnostic in 78% of patients. Two patients were misdiagnosed and in 20 patients other investigations were required for the confirmation of diagnosis. The sensitivity and specificity of ultrasound in diagnosing acute appendicitis, renal calculus, liver abscess, mesenteric lymphadenitis, acute pancreatitis and ovarian cyst was 100% and in calculus cholecystitis it was 93.75% and 100% respectively. **Conclusion:** Ultrasonography is superior in organ system imaging. It helps in showing organ specific lesions and its accurate measurement which is helpful in follow up and response to treatment. Ultrasonography is also helpful in diagnosing alternative disease and to reduce negative laparotomy rate.

Keywords: Abdominal Pain, Acute Abdomen, Diagnosis, Ultrasonography.

Introduction

Of the several outstanding technological advances in all branches of medicine, perhaps the most outstanding is ultrasonography. Ultrasound has established itself as an invaluable tool in surgery. Its application is over expanding due to excellent work executed in several specialized institutes and clinics.

Abdomen is rightly known as “magic box”. The term “acute abdomen” refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy. This challenging clinical scenario requires a thorough and expeditious workup to determine the need for operative intervention and initiate appropriate therapy. It goes without saying how important it is to make the diagnosis as early as possible in these conditions.

In surgical practice, abdominal pain is perhaps the most common symptom encountered, and almost in every case of abdominal pain the surgeon prefers to go for ultrasonography to confirm the diagnosis. Only one quarter of patients who have previously been classified with an acute abdomen actually receive surgical treatment, so the clinical dilemma is if the patients need surgical treatment or not and, furthermore, in which cases the surgical option needs to be urgently adopted. [1] Although physical examination of the patient is the most important part in proper diagnosis, many a time some positive help is required in the form of investigations. For this added help, ultrasonography plays a great role. [2]

Ultrasonography is cheap, non-invasive, reliable, simple to perform, has no contraindications and can be repeated as and when required. It is a high-resolution imaging technique. Its versatility and real-time imaging capability are also major advantages. Another unique advantage is the Doppler ultrasound, which allows visualization of blood flow and assessment of flow dynamics. Ultrasound units are now smaller and more portable, so they are widely used in multiple medical settings, including the bedside, operative suite, emergency room, and in diagnostic and interventional radiology suits. Miniaturized high-resolution transducers also facilitate laparoscopic and endoscopic procedures.

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However, ultrasound is very operator dependent; quality of ultrasound imaging and diagnosis is influenced greatly by the experience of the examiner.

Materials and Methods

This was a prospective study of one hundred patients between the age of 1-80 years (54 males and 46 females) carried out at a tertiary hospital in Ahmedabad during a period of eight months.

Only those non traumatic patients who were admitted in the ward with complaints of severe abdominal pain were selected in the study. Patients with a history of trauma and with chronic abdominal pain attending the OPD were excluded from the study.

The equipment was real-time ultrasonographic apparatus with a video graphic scanner (Toshiba) which uses a frequency of 3.75 MHz for abdominal ultrasonography and 5 MHz for trans-vaginal and trans-rectal ultrasonography.

All the 100 admitted patients were examined in the ward and provisional clinical diagnosis was made by the information obtained from clinical history and physical examination. Simultaneously, routine laboratory and radiological investigations were carried out. Data collected from routine investigations was used to reach a reasonable provisional diagnosis.

Following this, all the patients were examined by radiologists with the pre-requisite of nil per oral from previous night and bowel preparation. With co-relation of clinical history, physical findings and ultrasonographic findings, ultrasonographic diagnosis was made.

Out of the 100 patients, 58 patients were managed conservatively while the rest 42 patients were operated at appropriate time. Operative findings were noted and fluid or tissue collected pre or per operatively were sent for histo-pathological examination. The histo-pathological report was noted.

Final diagnosis was made after the surgery and histo-pathological report. Comments on individual cases were noted.

Results

Sensitivity and Specificity of Ultrasonography in Diagnosis of Disease

	No. of Cases	**No. of cases where USG was helpful**	**Sensitivity**	**Specificity**
Appendicitis	20	20	100%	100%
Calculus Cholecystitis	16	15	93.75%	100%
Renal Calculus	17	17	100%	100%
Liver Abscess	10	10	100%	100%
Mesenteric Lymphadenitis	6	6	100%	100%
Acute Pancreatitis	5	5	100%	100%
Ovarian Cyst	2	2	100%	100%
Miscellaneous	13	12	92.30%	98.85%

According to the above results, ultrasonography is highly sensitive and specific for diagnosis of prevalent pathologies of acute abdominal conditions and almost gold standard.

Overall Diagnostic Accuracy of Ultrasonography in Acute Abdominal Conditions

USG	**No. of patients**	**Percentage**
Diagnostic	78	78%
Mis-diagnostic	2	2%
Other investigations required	20	20%

In this study ultrasonography was diagnostic in 78% of patients. Two patients were misdiagnosed and in 20 patients other investigations were required for confirmation of diagnosis.

Discussion

In this study, the ultrasonographic diagnosis proved to be correct in 100% cases of liver abscess. However in one case of portal hypertension ultrasonography misled us and gave the differential diagnosis of splenic mass/abscess/cyst which proved to be wrong on further study. Ultrasonography is highly accurate in gall bladder conditions, except in one case of CBD stone where the diagnosis of thrombus tumor in portal vein was made which proved to be wrong. The sensitivity and specificity of ultrasonography in diagnosing pancreatic conditions is 100%. In cases of gastritis, no specific pathology was found on ultrasonography. In mesenteric lymphadenitis, ultrasonography accurately diagnosed the condition and all patients were managed conservatively. In appendicitis, it gave an accurate diagnosis in all the cases.

There are a few studies which have looked at the various parameters we analyzed. Al Ajerami [3] in his study on acute appendicitis found the overall sensitivity and specificity of ultrasound, using surgical outcome as the gold standard, to be 84.8% and 83.3% respectively. Allemann et al [4] reported that in USG done by surgeons for patients with acute abdominal pain the correct diagnostic rate from 348 patients (70%) to 414 patients (83%). In the same study, USG was found to have a sensitivity and specificity of 94% and 99% in diagnosing biliary tract disease. Mishra et al [5] in their study of imaging for acute abdomen had 13 cases of appendicitis. USG was diagnostic in 11 with sensitivity and specificity of 91.6% and 97%. Zoller et al [6] in their meta analysis demonstrated that USG has sensitivity of 85% and a specificity of 96% in diagnosing acute appendicitis. Mc Grath et al [7] in their study on the role of early USG in the management of the acute abdomen concluded that it is most useful in the diagnosis of gynecological disorders. Manfredi et al [8] concluded that USG in acute pancreatitis is a good screening test in patients with suspected biliary pancreatitis and a mild clinical course but contrast enhanced CT is preferred for patients with acute pancreatitis.

A prospective study was carried out by Caterino et al [9] covering 301 patients during 4 years in the Ist Institute of Surgery at the University of Rome. After immediate clinical evaluation, an ultrasonographic examination was performed in each patient. After follow up, patients were divided into following groups:

- Group A: Diagnosis was made by sonographic examination which had not been clinically expected.
- Group B: Ultrasonography confirmed the first diagnosis clinically suspected.
- Group C: Ultrasonography revealed the 2nd or 3rd differential diagnosis to be correct.
- Group D: Ultrasonography made no contribution to the diagnosis.

The comparison of the two studies is as follows:

Group	Our study (100 patients)	Caterino's study (301 patients)
Group-A	20 patients (20%)	38 patients (12.7%)
Group-B	60 patients (60%)	161 patients (53.3%)
Group-C	18 patients (18%)	23 patients (7.7%)
Group-D	2 patients (2%)	77 patients (25.5%)

Findings of the 2 studies are almost similar in group A, B and C. However there is disparity in group D. The difference is mostly due to variation in the total number of patients studied in both the studies. The result of this study demonstrates the usefulness of emergency ultrasonography in acute abdominal conditions involving various organ systems and associated pathologies.

Results obtained show that ultrasonography is highly accurate. In majority of the systems, a definite diagnosis was made.

Conclusion

Ultrasonography is cheap, non-invasive, reliable, simple to perform, has no contraindications and can be repeated as and when required. It also allows complete portability so that studies can easily be carried out at the bed side, in the emergency room in case of critically ill patients and even in the operating room.

For the abdominal surgeon, ultrasound provides a vital diagnostic and management aid in the assessment of the intra-abdominal diseases. It has a very high accuracy in cases of acute abdomen. Ultrasonography is superior in organ system imaging. It helps in showing organ specific lesions and its accurate measurement which is helpful in

follow up and response to treatment. Ultrasonography is also helpful in diagnosing alternative disease and to reduce negative laparotomy rate.

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