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ORIGINAL ARTICLE

Comparative Study of Diagnostic Value of Plain Abdominal Radiograph, Ultrasonography and Clinical Impression of the Surgeon in Acute Peritonitis

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Abstract

Background: Peritonitis persists to be one of the major abdominal emergencies encountered by surgeons. The diagnosis of the peritonitis always calls for a refined history taking and a comprehensive physical examination. Imaging diagnostic aids have an important role in establishing the diagnosis of acute peritonitis. Aim of the study was to compare the diagnostic value of plain abdominal radiograph, abdominal ultrasonography and observations of the surgeon. **Methods**: The present study was carried out in our tertiary care hospital. It was a comparative study comprising of 50 patients with peritonitis. **Results**: Tenderness (100%) along with Guarding/ Rigidity (90%) was the classical signs noted in patients with Perforation peritonitis, distension was noted in 64% of patients with observation of liver dullness in 74 % of patients. X-ray chest and X-ray erect abdomen showed signs of perforation in 34 (68%) cases. Ultrasonography of abdomen showed findings suggestive of perforation in 42 (84%) patients. **Conclusion**: In diagnosis of perforation peritonitis, impressions of surgeon based on clinical examination are superior over routinely used radiological investigations in emergency setting.

Key words: Acute abdomen, X-ray abdomen, emergency

Introduction

Peritonitis is defined as inflammation of serosal membrane that lines the abdominal cavity and the organ contained therein. The peritoneal cavity which is otherwise a sterile environment reacts to a variety of stimuli with fairly uniform inflammatory response. Peritonitis is considered a clinical diagnosis. Peritonitis may be primary, secondary or tertiary. Patients presenting to surgical emergency comprise mainly of secondary peritonitis. Imaging diagnostic aids have an important role in establishing the diagnosis of acute peritonitis. Routinely done additional radiological investigations encompass plain abdominal radiograph and ultrasonography [1,2]. Exact pre-operative diagnosis of peritonitis remains challenging despite proper history taking and clinical examination, as well as advancement in new imaging techniques [3]. Recognizing the red flags in the history and physical examination and the initial imaging and laboratory findings helps to determine which patients may have a serious underlying disease process, and therefore warrant more expedited evaluation and treatment [4].

The study presented here is aimed to analyse the incidence, causative factors and different modes of presentations and management of cases of peritonitis of non-traumatic origin. An attempt is made to compare the diagnostic value of plain abdominal radiograph, abdominal ultrasonography and observations of the surgeon.

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Material and Methods

The present comparative study comprising of 50 patients with peritonitis was done. The study was conducted after approval from Institutional Ethics Committee and informed consent of patients.

A detailed history of patients was taken and the signs and symptoms along with information such as pain, vomiting and bowel movements were recorded. In addition personal and family history was recorded. General physical examination was done and special emphasis was given on abdominal examination, recording the contour, movement with respiration, shifting liver dullness, tenderness, guarding/ rigidity, rebound tenderness and bowel sounds. The radiological examination was conducted in all clinically positive cases with X-ray Chest and abdomen in erect position to detect the presence of air under the diaphragm and air-fluid levels. All the cases underwent abdominal ultrasonography whole abdomen. Any additional or abnormal findings were recorded including ascites, pneumoperitoneum and dilated bowel loops with thickened wall. This was followed by surgical intervention. The patients were informed and consent for surgery was taken. The results were compared as mentioned thereof.

In all cases monitoring of the vital signs was done and pre-operative correction of fluid and electrolyte imbalance was done along with broad spectrum antibiotic coverage. Blood investigations like complete hemogram, blood grouping, renal function tests and serum electrolytes were done.

Results

A total of 50 patients of gastrointestinal perforations were studied. The mean age of the patients was 36.6 yrs and range was 10 to 60 yrs. The youngest patient was 10 yrs (Colonic perforation). The maximum incidence of perforation was observed in 30 to 39 yrs. In our study majority of patients were male (46) and only 4 females. According to etiology, peptic ulcer was the major causative factor leading to perforation peritonitis (Table 1).

Pain was a predominant symptom seen in all the cases (Table 1). Pearson Chi-Square Value for vomiting is 0.079, nausea is 0.076, distension is 0.749 and fever is 0.000 which is the only significant finding**.** History of chronic pain abdomen was seen in 17 cases. Tachycardia was seen in 36 cases and shock in 4 cases.

Tenderness (100%) along with guarding/ rigidity (90%) was the classical sign noted in patients, distension was seen in 64% of patients and liver dullness was seen in 74 % of patients.

As per etiology the Peptic ulcer perforation showed the maximal presence of guarding and rigidity, obliteration of liver dullness, absence of bowel sound and tenderness (Table 2). Pearson Chi-Square p-Value for distension is 0.749, guarding /rigidity is 0.538, obliteration of liver dullness is 0.132 and absent bowel sounds is 0.011 which is the only significant finding.

X-ray chest and erect X-ray abdomen were taken after clinical diagnosis of perforation. This was found in 34 cases (68%). Few cases also showed dilated bowel loops and presence of free fluid. Pearson chi square p-value of 0.066 for X-ray erect abdomen is insignificant. In 95.83% of the cases involving stomach, gas under the diaphragm was noted. However only in 25% cases pneumoperitoneum was detected in appendicular perforation and those of large gut overall were 33.33% positive for x-ray pneumoperitoneum. Pearson chi

Table 1: Symptoms in relation to aetiology

Etiology	No. of Cases (%)	Pain (%)	Vomiting (%)	Distension (%)	Fever (%)	Nausea (%)
Peptic Ulcer	31 (62)	31 (100)	19 (61.2)	19 (61.2)	6 (19.35)	26 (83.87)
Appendicular	4 (8)	4 (100)	4 (100)	2 (50)	4 (100)	4 (100)
Typhoid	7 (14)	7 (100)	7 (100)	4 (57.14)	7 (100)	7 (100)
Tubercular	1 (2)	1 (100)	1 (100)	1 (100)	0 (0)	1 (100)
Oncogenic	1 (2)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)
Idiopathic	6 (12)	6 (100)	4 (66.67)	5 (83.33)	3 (50)	4 (66.67)

Table 2: Abdominal signs in relation to etiology of perforation

Etiology	Distension	Tenderness	Guarding/ Rigidity	Obliteration of Liver dullness	Absent Bowel Sounds
Peptic Ulcer	19	31	29	26	30
Appendicular	2	4	4	1	2
Typhoid	4	7	5	4	4
Tubercular	1	1	1	1	1
Oncogenic	1	1	1	1	1
Idiopathic	5	6	5	4	3
Total	32	50	45	37	41

square p-value is 0.006 and is significant (Table 3).

Ultrasonography of the abdomen was done in all patients in whom clinical signs of perforation were suspected. USG was suggestive of perforation in 42 patients (84%). Evidence of perforation was in the form of pneumoperitoneum or indirect (presence of free fluid with echogenicity, thickened bowel loops with edematous wall). Pearson chi square p-value of 0.031 for USG abdomen is significant (Table 4).

Discussion

Gastrointestinal perforation constitutes a majority of emergency operations in our hospital. In our institution, peptic ulcer perforation ranked first in the abdominal emergencies followed by perforation of ileum and duodenum in that order.

The maximum incidence of perforation irrespective of pathology was seen between 30-39 years in the present study. M C Dandapat et al [4], D C M Rao [5] and W T Siu et al [6] also reported similar findings. Results of the studies by Gupta SK [7] and Memon et al [8] also reveal that there is male preponderance in acute peritonitis. The commonest site of perforation was stomach and duodenum (62%) followed by ileum (22%), appendix (8%), colon and caecum (6%) and jejunum (2%).

Pain abdomen, vomiting, distension and fever were the predominant symptoms in our study. Pain abdomen was seen in all cases and similar finding has been reported by Rohit DK et al [9] and Kachroo R. et al [10]. In peptic ulcer perforation, most of our patients gave history of pain in the epigastric region; it has also been reported by S N Mathur [11]. Recent history of fever followed by pain abdomen was found in majority typhoid perforations. Noorani MA [12]have observed similar history. Fever was also seen in all cases of appendicitis after pain which was also found in a study conducted by Sir Zachari Cope [13]. Peptic ulcer does not predominantly present with fever in our study (19.35%) as compared to 46.6% found by Rohit DK et al [9].

History of pain abdomen suggestive of peptic ulcer disease was present in 54.84% patients. Most of the patients were smokers, alcoholics or both. One third patients had similar history in study conducted by Rohit DK et al [9]. Non-steroidal anti-inflammatory (NSAIDS) drugs are known to precipitate peptic ulcer disease and perforation. Here 51.62% cases of peptic ulcer perforation had history of NSAID use. In study by W T Siu [6], 18.18% patients had similar history and 26.6% in study by Rohit DK et al [9].

Dehydration was commonly seen in gastric perforation (64% cases); a feature also observed by S K Nair [16]. Tachycardia was seen in 68% cases while J C Baid [17] noted it in 77% cases and Rohit DK et al [9] in 80% cases.

On examination, tenderness was the most sensitive finding seen in all cases (100%), guarding/rigidity in 90%, absent bowel sounds in 82%, obliteration of liver dullness in 74% and distension in 64%. Distension was not found in majority of appendicular perforations because of localized peritonitis. In most of the studies tenderness is present in all cases of gastro-intestinal perforation [9,15]. In our study, liver dullness was not obliterated in 13 patients of perforation. This might be because of the sealed perforation or adhesions around the site of perforations. The study correlates with the other studies with regard to signs of perforation [9,15].

Clinically the diagnosis of perforated peptic ulcer peritonitis was made in 33 cases but on laparotomy peptic ulcer

Table 3: Pneumoperitoneum in relation to site of perforation

Site of Perforation	No. of clinically positive Cases as per surgeon	No. of positive Cases (presence of free air under the diaphragm)
Stomach	24	23(95.83)
Duodenum	9	3(33.33)
Jejunum	0	0(0)
Ileum	11	6(54.54)
Appendix	4	1(25)
Colon and caecum	2	1(50)

Table 4: USG findings in relation to site of perforation

Site of Perforation	No. of clinically positive Cases as per surgeon	No. of positive Cases as per USG
Stomach	24	21
Duodenum	9	6
Jejunum	0	2
Ileum	11	8
Appendix	4	2
Colon and Caecum	2	3
Total	50	42 (84%)

perforation was present in 31 cases (93.93%). In a study by Shukla et al [16], 92.59% patients had duodenal ulcer perforation at laparotomy in relation to clinical diagnosis. Two cases of clinically peptic ulcer perforation turned out to be jejunal and appendicular perforations. Out of 4 cases of clinically diagnosed perforated appendix, three had appendicular perforation and one was of colonic perforation. Clinically acute appendicitis and perforated appendix was diagnosed with the clinical accuracy of 75%. Based upon clinical assessment accurate diagnosis of acute peritonitis with its underlying cause could be made in 94% of patients. Flasar et al [17], Shukla A et al [16] and Rohit DK [9] had also documented similar findings.

Even though presence of gas under the diaphragm is a hallmark of hollow viscous perforation, absence of this does not exclude the possibility of perforation. In our study, we found it in 68% of cases compared to 60-70% by William N [18], 72.35% by M C Dandapat et al [4] and 80% cases in study by Rohit DK et al [9]. In only 1 out of 4 cases of appendicular perforation, gas under the diaphragm was noted. This may be due to confinement of the perforation as well as absence of air in the lumen. Prassannan et al [19] has reported that plain abdominal films are useful in 4.8% of cases of appendicitis.

Ultrasound abdomen is a readily available, non-invasive, easily repeatable investigation to find out the free fluid in the peritoneum due to gastro-intestinal perforation due to any cause. In our study, we found USG findings suggestive of perforation peritonitis in 84% cases. M D Tripathi and colleagues [20] found the result quite decisive. Shukla A et al [16] also found USG suggestive of perforation peritonitis in 80% of cases. Hebbar AK et al [21] found it in 70% of patients. Our study correlates with the majority of studies.

While Ultrasonographic findings were suggestive of perforation peritonitis in 84% of patients and X-ray with free air under dome of diaphragm was found only in 68% cases in comparison to clinical finding of Tenderness present in 100% of cases and guarding/rigidity in 90% cases.

Conclusions

Based on this study, impression of surgeon seems to be superior over radiological investigations although cause of peritonitis is settled only after laparotomy.

Conflict of Interest:	All authors declare no COI
Ethics:	There is no ethical violation as it is based on voluntary anonymous interviews
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