Section: General Surgery

Original Research Article

STUDY TO ANALYZE BACTERIOLOGICAL AND SENSITIVITY PATTERNS IN PERITONEAL FLUID IN CASE OF PERFORATIVE PERITONITIS

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Abstract

Background: Perforation peritonitis is one of our practice's most common surgical emergencies. The study aimed to analyze bacteriology and its sensitivity patterns in peritoneal fluid in case of perforative peritonitis admitted in Government Theni Medical College to select appropriate empirical antibiotic therapy. **Materials and Methods:** This prospective comparative study was conducted at Government Medical College, Theni, over 12 months. The study included 50 patients with perforation peritonitis who presented to GTMCH, Theni. Inclusion criteria involved confirmed perforation peritonitis while excluding primary peritonitis and trauma-related cases. Peritoneal fluid was collected during laparotomy and analyzed for culture and sensitivity. Parameters observed included patient demographics, presentation time, general condition, nutritional status, presence of malignancy, and postoperative complications. **Result:** The highest number of patients was 41-50 years old; males constituted a larger proportion (66%) than females (34%). The duration of symptoms varied, with most patients experiencing symptoms for 2-3 days. Perforation sites were primarily observed in the duodenum (48%) and gastric (40%) areas. E. coli and Klebsiella were the most commonly isolated microorganisms. The duration of symptoms was linked to specific microorganisms, with E. coli and Klebsiella often observed after 2-3 days of symptom onset. Antibiotic sensitivity patterns revealed varying responses among different microorganisms. Complications included wound infections, respiratory complications, dehiscence, abdominal collections, and anastomotic leaks. **Conclusion:** Perforative peritonitis morbidity and mortality are mainly due to Klebsiella and E.coli. Early initiation of antibiotics and changing to higher antibiotics according to culture sensitivity may reduce postoperative complications, morbidity, and mortality.

INTRODUCTION

Perforation peritonitis is one of the commonest surgical emergencies in our practice. Though there are many current medical advances, perforation peritonitis still has a most important risk to the surgeon.[1] The most important hassle faced with the aid of the surgeons is the late presentation of the patient to the health practitioner and the development of resistant bacterial organisms that reason peritonitis and sepsis. With the growing danger of emerging drug resistance to antibiotics, this trouble has to be taken care of rapidly.[2]

Primary peritonitis is a bacterial infection of the peritoneal cavity arising from lymphatic or hematogenous spread.[3] It occurs most commonly in alcoholic cirrhosis with ascites and in nephritic syndrome. The presence of ascites increases the risk of developing peritonitis due to low protein concentration. Secondary peritonitis occurs due to contamination from intraperitoneal organs inside the peritoneal cavity.[4] Most cases occur due to important lesions in the duodenum, stomach, and appendix. 10% of secondary peritonitis cases occur as a complication of abdominal surgery.[5] Tertiary peritonitis refers to chronic diffuse peritonitis after

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preliminary secondary peritonitis therapy. It appears to signify both failures of host response and superinfection.[6]

Infection of the peritoneal cavity following perforation results in the illness of the peritoneal cavity with bacteria, which is handled with conventional antibiotics therapy,[7] is complicated via each using the emergence of antibiotic resistance and improved affected person populace intrinsically at risk for nosocomial infections. All the above factors make the doctor do peritoneal fluid tradition intraoperatively.[8,9] Avery confirmed that there is increasing proof for drug resistance to empirical drug therapy for organisms remote in peritoneal fluid. The need for lowering antibiotic publicity and cost of know-how bought from watching microbial sensitivity pattern support movements needed for peritoneal fluid culture. This study on peritoneal fluid culture and its antibiotic sensitivity in perforative peritonitis patients.

MATERIALS AND METHODS

The prospective comparative study was conducted at the Government Medical College, Theni, for 12 months (June 2021 to May 2022) on 50 patients with perforation peritonitis.

Inclusion Criteria

Age > 18 years and the patient presenting with features of perforation peritonitis confirmed by X-ray were included.

Exclusion Criteria

Patients presenting with primary peritonitis and peritonitis due to penetrating trauma were excluded.

Peritoneal fluid was collected during the laparotomy procedure and processed for culture test and sensitivity. The transportation of fluid was conducted under sterile pus culture and sensitivity containers. Patient age, the time interval of the presentation, general condition and nutritional status of patients, presence of any malignancy, and postoperative complications were observed.

Statistical Analysis

Data were collected and entered into MS Excel sheets, and SPSS 21.0 version software was used to conduct the analysis. Demographic data were expressed as the frequency and percentage.

RESULTS

Among 50 patients were 33 male patients (66%) and 17 female patients (34%). The table indicates a higher proportion of male patients than female patients [Table 1]. 11 patients (22%) in the age range of 20-30 years and the same number in the age range of 31-40 years. The highest number of patients, 16 (32%), fell within the age range of 41-50 years. Twelve patients (24%) were above 50 years of age. The mean age of all the patients was 41.3 years, with a standard deviation of ±11.52 [Table 1].

Four patients (8%) in the study population reported experiencing symptoms for < 1 day. Most patients, 25 individuals (50%), had symptoms lasting between 2 and 3 days. Seventeen patients (34%) reported 4 to 5 days of symptom duration. Similarly, four patients (8%) had symptoms that persisted for > 5 days.

Duodenal perforation was the most prevalent, accounting for 48% of the cases, followed by gastric perforation at 40% and ileal perforation at 12%. Among the microorganisms isolated, Klebsiella had the highest frequency at 34%, followed by E. coli at 28% and Pseudomonas at 16%. Proteus was isolated in only 4% of the cases. No microorganism growth was observed in 18% of the cases [Table 2].

The number of cases where specific microorganisms were found in each site. Five gastric perforation cases were associated with E. coli, 9 with Klebsiella, 3 with Pseudomonas, 1 with Proteus, and 2 with no growth. Similar comparisons are made for duodenal and ileal perforations [Table 3].

Table 1: Distribution of gender and age group

		Frequency	Percentage
Gender	Male	33	66
	Female	17	34
Age group	20-30 Years	11	22
	31-40 Years	11	22
	41-50 Years	16	32
	>50 Years	12	24
	Mean Age	41.3±11.52	

Table 2: Distribution of site of perforation and microorganism isolated

		Frequency	Percentage
Site of perforation	Duodenum	24	48
	Gastric	20	40
	Ileum	6	12
Microorganism isolated	E. coli	14	28
	Klebsiella	17	34
	Pseudomonas	8	16
	Proteus	2	4
	No growth	9	18

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Table 3: Comparison between the site of perforation and microorganism isolated

Microorganism isolated	Gastric	Duodenum	Ileum
E. coli	5	7	2
Klebsiella	9	6	2
Pseudomonas	3	3	2
Proteus	1	1	0
No growth	2	7	0

Table 4: Antibiotic sensitivity pattern of the bacteria

Sensitivity Pattern	E. coli	Klebsiella	Pseudomonas	Proteus
Ampicillin	2	1	0	0
Ciprofloxacin	12	14	1	1
Amikacin	12	14	1	1
Ceftriaxone	11	2	1	1
Ctz	1	1	0	0

Table 5: Complications of the patients and their percentages

Complications	Frequency	Percentage
Wound infection	10	20
Respiratory complication	3	6
Dehiscence	6	12
Abdominal collection	3	6
Anastomotic leak	1	2

Comparison between the duration of symptoms and microorganism isolated

The symptoms ' duration with the E. coli infection was 2-5 days, and in Klebsiella, major growth was found after 2-3 days of duration. Pseudomonas showed the duration of the symptoms in 2-5 days. Proteus showed growth after 2-3 days of duration [Figure 1].

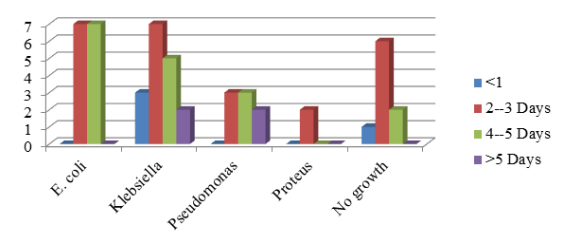

Figure 1: Duration of symptoms and microorganisms isolated.

[Table 4] presents the antibiotic sensitivity pattern of the bacteria. It shows the number of patients within each microorganism category that exhibited sensitivity to different antibiotics. For example, 12 E. coli cases, 14 Klebsiella cases, and 1 Pseudomonas case were sensitive to ciprofloxacin.

[Table 5] focuses on the complications observed in the patients. It highlights that among the patients, 20% experienced wound infections, 6% had respiratory complications, 12% had dehiscence (wound separation), 6% had abdominal collections, and 2% had anastomotic leaks.

DISCUSSION

Perforative peritonitis caused by hollow viscus perforation is common. It has a high mortality rate due to the late presentation of patients to the hospital. In our study, 32% of patients belong to 41-50 years, 24% to >50 years of age, 22% between 31-40 years and 20-30 years of age. The mean age of this study was 41.3±11.52 years. In Kishore RVR et al.'s study, most patients were 35-45.[10] In Ravishankar et al., study majority of the patients belong to 31-40 years followed by 20-30 years. The mean age of presentation is 35.26 years of age.[11]

In our study, 66% were male, and 34% were female. The Kishore RVR et al. study comprised 54 (83.1%) male and 11 (16.9%) female patients. 50% of patients have symptoms for 2-3 days, 34% have 4-5 days duration, and 8% have < 1 day and > 5 days of duration.[10] In Ravishankar et al., study majority of the patient reaches the hospital within 2-3 days of symptoms, roughly 50% of cases. Only 11% of patients with perforation peritonitis present to us within one day of symptom.[11] Kishore RVR et al. study Most common perforation site was the pre-pyloric part of the stomach (35.3%), followed by the appendix.[10] In Ravishankar's study, the most common perforation site is in the 2nd part of the duodenum, 52%, followed by gastric in 42% of cases. Most are likely of peptic ulcer in origin. Only about 3 cases, i.e., 6%, were due to ileal perforation and are of nontyphoid origin.[11] In our study, 48% have a perforation in the duodenum, 40% have gastric perforation, and 12% have ileal perforation.

In a study by Boueil et al., 144 cases were analyzed, consisting of 47 cases (33%) in children and 97 cases (67%) in adults, all of whom had perforated appendicitis. Among the cases, 51 individuals (35%) presented with generalized peritonitis, and laparoscopic treatment was administered in 30 cases (59%).[12] Additionally, the ileum (32%), appendix (18%), and stomach (18%) were the most common site of infections in the study conducted by Lohith et al.[13]

Kishore RVR et al., a study in peritoneal fluid culture from 64.7% of patients was positive for cultures, of which the most common microbe isolated was E. coli (27.6%), 18.4% of cultures were positive for

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Klebsiella, 13.8% were Pseudomonas, Staphylococcus from 12.3% of patients. Proteus and Acinetobacter accounted for 0.04% and 0.01%, respectively. The peritoneal fluid cultures were negative in 21.5 % of patients.[10] In Ravishankar et al. study, the most common organism grown was Klebsiella, 46%, followed by E coli; in 34% of cases, only 2% showed mixed E coli and Klebsiella growth. In about 7 cases, i.e., 14% showed no growth in their culture.[11] In our study, 34% were Klebsiella, 28% were E. coli, 16% were Pseudomonas, 4% were Proteus, and 18% were negative cultures. However, the study conducted by Jang et al. reported enterococcus faecium (35.2%) as the most common gram-positive bacterium and E. coli as the gram-negative bacterium.[14]

In the Kishore RVR et al. study, Isolates of E. coli were sensitive to ampicillin (54.2%), aminoglycosides (62.7%), cephalosporins (52.2%), quinolones (50.8%), linezolid (55.9%), piperacillin (76.2%), imipenem (88.1%). Most isolates of Acinetobacter were sensitive to piperacillin (75%) and imipenem (88.1%). The sensitivity of Pseudomonas and Streptococcus to quinolones was less than 29.5% and 29.4%, respectively.[10] In our study, E. coli was more sensitive to ampicillin and ciprofloxacin, and Klebsiella was sensitive to ciprofloxacin and Amikacin. In contrast to our study findings, Lohith et al. reported gentamycin (p=0.006), colistin (p=0.018), piperacillin and tazobactam (p=0.022) as the most sensitive antibiotics.[13] This difference can be due to the change in bacterial culture and sensitivity patterns.

The majority of the complications in our study were wound infection and dehiscence. 6% were respiratory complications and abdominal collection. 3% developed respiratory complications, and 2% developed an anastomotic leak. In the Kishore RVR et al. study, around 53.8% of patients who underwent surgery had an uneventful recovery. The most common complication noted was surgical site infection (20%). Death, Anastomotic leak, and wound dehiscence accounted for 1.5%, 3.0%, and 12%, respectively. 6.1% of patients had respiratory problems in the post-op period.[10] The study conducted by Boueil et al. reported postoperative complications in 32 patients (22%), including abdominal abscesses (n=20) and wound infection. In addition, the complications that arise were due to the unsuitable antibiotic treatment in patients.[12]

The current study reports that most of the cases of perforative peritonitis can be due to the infection caused by Klebsiella and E. coli species; however, the poor outcome can be based on the resistance to antibiotic treatment or late initiation of antibiotics. Similar data was also revealed by Cheong et al., where the study demonstrated that outcomes of treatment in perforative peritonitis were dependent on the infectious organism and appropriate antibiotics treatment.[15]

CONCLUSION

In perforative peritonitis, morbidity and mortality are mainly due to Klebsiella and E. coli. Early initiation of antibiotics and changing to higher antibiotics according to culture sensitivity may reduce postoperative complications, morbidity, and mortality.

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