Original Research Article

Septic complications in perforation peritonitis: microflora and search for therapia sterilisans Magna

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Abstract

Objective: This study was conducted to determine the etiology, anatomical site of perforation and the suitable empirical antibiotic in our region which decreases the bacterial load effectively and to decrease the morbidity associated with infectious complications in patients with peritonitis secondary to gut perforation. **Methods:** This study was a prospective study conducted for a period of one year. Patients who were fulfilled the inclusion criteria with peritonitis due to gut perforations and operated in our institute were included in this study. Data regarding patient demography, associated co-morbidities and relevant history were recorded. Duration of hospitalization, wound infection, wound dehiscence, anastomotic leak, re do surgeries and number of patients died after surgery were documented. Antimicrobial susceptibility testing was done by Kirby-Bauer disk diffusion method. Antibiotics were changed as per clinical progress of the patient and as per culture and sensitivity report. **Results:** Perforations were mostly ileal (38%) followed by duodenal (29%).Common etiology being peptic ulcer disease (38.7%) and typhoid fever (22.5%). Peptic ulcer perforations were managed by Graham patch omentopexy in 24 (38.6 %) cases, small bowel perforations by only stoma in 18 (29 %), primary repair 6 (9.6 %) cases and resection and anastomosis done in 8 (12.9%) who presented with multiple small bowel perforation. Appendicectomy was done in 6 (9.6%) cases.Sensitivity to Cefaperazone was about 66 % in E. Coli isolates while 75% for Ceftazidime while for Klebsiella 60% and 80% resperctively. Meropenam was sensitive in all the isolates of Staphyloccus, Streptococcus, Pseudomonas and Proteus while cefaperazone was sensitive only in 50 % of the cases. Piperacillin + Tazobactum were sensitive in all the isolates of Stryptococcus, Pseudomonas and Proteus. The sensitivity of Amoxicillin+ Clavulinic acid, Ceftriaxone, Aminoglycosides and Fluoroquinolones were very low. **Conclusion:** Most common organisms cultured from peritoneal fluid were E. coli and Klebsiella. Piperacillin + Tazobactum and Carbepenam were sensitive in most of the isolates and might be started in patients with perforation peritonitis as a empirical antibiotic therapy

Keywords: Peritoneal Fluid, Piperacillin + Tazobactum , Carbepenam ,Perforation Peritonitis Empirical Antibiotic Therapy

Introduction

Peritonitis secondary to gastrointestinal tract perforation is a common surgical emergency encountered in India with significant risk of mortality and mortality. With the availability of better health facilities, trained medical personnel, better operative and intensive care facilities, the mortality has been decreased from 60% in the past to 10 %. [1-4] But still the morbidity associated with perforation peritonitis is high and have been reported to be as high as 63% in some studies.[5] These post operative complications are mostly infectious in origin. Although perforation peritonitis is primarily managed surgically but even with the advances in the surgical technique and better operative facilities, the morbidity due to infectious etiology is still a major concern leads to prolonged hospital stay and redo surgeries.

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As the microflora of peritonitis, secondary to the perforation of hollow viscous not only depends on the site of perforation and associated etiological factors but also on antibiotic policies and practice. The microflora of the peritoneal cavity in patients with perforation peritonitis cannot be predicted accurately on the basis of etiology of the diseases. The microbial origin of peritonitis has been known since 1887 and later on the detailed analysis have been done by many people but still we are searching for the ideal antibiotic.[6,7] Apart from that there is a great variation and different opinions regarding empirical antibiotic therapy ideal for these patients.[8-12]

The ideal antibiotic should be the one which decreases the bacterial load to a significant level after administration of a single dose. The choice of antibiotics should be based on the knowledge of microflora and their appropriate antibiotic sensitivity pattern in that region to decrease the mortality and morbidity related to infectious etiology in patients with perforation peritonitis. This study was conducted to determine the etiology, anatomical site of perforation and the suitable empirical antibiotic in our region which decreases the bacterial load effectively to decrease the morbidity associated with infectious complications in patients with peritonitis secondary to gut perforation.

Materials and methods

Type, Duration & place of study

This study was a prospective study conducted for a period of one year in Department of Surgery& Microbiology in Rohilkhand Medical college and Hospital, Bareilly, U.P.

Inclusion criteria

All the patients aged 18 or more than 18 with peritonitis due to gut perforation and operated in our institute were included in this study.

Exclusion criteria

Patients with peritonitis seconadary to previous GI surgeries, patient diagnosed with carcinoma of GI tract, patient with abdominal penetrating injuries, redo surgeries or peritonitis secondary biliary or gyanecological surgeries were excluded from the study.

Consent

Written consent was obtained from the relatives of patients after explaining them the nature and purpose of the study. They were assured that confidentiality would be strictly maintained. The option to withdraw from the study was always open.

Diagnosis

Diagnosis was made on the basis of clinical examination followed by X-ray abdomen erect, USG abdomen or CECT abdomen. Patient was resuscitated, investigated accordingly and empirical antibiotic combination (Inj Piperacillin + Tazobactum, Inj Amikacin and Inj Metronidazole) were started.

Surgical Procedure

Exploratory laparotomy was done through midline vertical incision. Peritoneal fluid was collected and sent for aerobic culture and sensitivity and for detection of fungal colonies. Site of perforation was recorded. Graham patch omentopexy, primary repair, resection and anastomosis or appendicectomy was performed as per etiology and site of the perforation. Peritoneal toileting was done with 6-8 L normal saline. Wound was closed after placing two drains with continuous prolene no 1 round body and Nylon 2-0 cutting body.

Post-operative care

After surgery patient were managed with intravenous fluids and empirical antibiotics were continued and were changed as per progress of the patient guided by culture and sensitivity report. Duration of hospitalization,,wound infection, wound dehiscence, anastomotic leak, re do surgeries and number of patients died after surgery were documented.

Antibiotic susceptibility testing

Antimicrobial susceptibility testing was done by Kirby-Bauer disk diffusion method. The organisms were tested against the commonly used antibiotics in patient with perforation peritonitis and as per susceptibility and resistance pattern available in our region. Growth inhibition zone diameters were measured in millilitres and results interpreted as recommended by the Clinical laboratory standards institute (CLSI) guidelines 2013. Minimal inhibitory concentration (MIC) determination was done by Broth microdilution technique and was interpreted as per CLSI guidelines 2013.

Observation chart

Table 1: Anatomical site of perforation

S. NO.	SITE OF PERFORATION	NO. OF PATIENTS	PERCENTAGE
1	Gastric	06	9.6
2	Duodenal	18	29
3	Jejunal	04	6.4
4	Ileal	24	38.7
5	Appendicular	06	9.6
6	Caecum	02	3.2
7	Colon	02	3.2
Total		62	100

Table 2: Etiological agent of perforation peritonitis

ETIOLOGY	NO OF PATIENTS	PERCENTAGE
PEPTIC ULCER DISEASE	24	38.7
TYPHOID FEVER	14	22.5
TUBERCULAR	04	6.4
IDIOPATHIC STRICTURE AND BAND	04	6.4
APPENDICITIS	06	9.6
MESENTERIC ISCHEMIA	02	3.2
OBSTRUCTED HERNIA	02	3.2
TRAUMA	4	6.4

Table 3: Microflora of peritoneal fluid aspirated

Culture report	Number of patients	%
Gram negative organism		
E. coli	26	41.9
Klebsiella	10	16.1
Pseudomonas	2	3.2
Proteus	2	3.2
Gram positive organism		
Streptococci Group D	2	3.2
Staphylococcus aureus	4	6.4
Yeast		
Candida	4	6.4
Sterile	12	19.3

Table 4: Antibiotic sensitivity pattern

Organism Isolated	Amoxy -clav	Ceftazidin e	Ceftr - oxone	Cefaperazone + Sulbactam	Piperacillin +Tazobacta m	Meropene m	Quinolon e	Amikaci n
E. coli	2	18	10	16	22	24	8	12
Klbesiella	-	8	2	6	9	10	4	6
Streptococcus	1	1	1	2	2	2	0	1
Staphococcu s aureus	0	3	0	1	3	4	2	0
pseudomonas	0	1	0	1	2	2	2	1
Proteus	0	0	0	0	1	2	0	0

Table 5: Post operative complications and outcome

Wound infection	12 (19.3%)
Wound dehiscence	8 (12.9%)
Leak	2(3.2%)
Deaths	2 (3.2%)

Results

Peptic ulcer perforations were managed by Graham patch omentopexy in 24 (38.6 %) cases. Small bowel perforations were managed by only stoma 18 (29 %), primary repair 6 (9.6 %). resection and anastomosis in 8 (12.9%) patients presented with multiple small bowel perforation and appendicectomy in 6 (9.6%) cases.In this study, out of 62 cases, 12 cultures were sterile while in 50 cases bacteria were isolated from peritoneal fluid on aerobic culture and sensitivity. Fifty isolates were Gram negative, 6 Gram negative and in 4 cases candida were isolated. Most common organism was *E. coli* 26 (%) followed by *Klebsiella* 10 (%) and *staphylococcus aureus* 4(%). *Streptococci, Pesudomonas and proteus* were isolated in 2 cases each. [Table-3]The sensitivity of E coli and Klebsiella were found to be sensitive to Meropenam in all the cases while sensitivity to Piperacillin + Tazobactum is almost 91 % and 90 % respectively. Sensitivity to Cefaperazone was about 66 % in E. Coli isolates while 75% for Ceftazidime while for Klebsiella 60 % and 80 % resperctively. Meropenam was sensitive in all the isolates of Staphyloccus, Streptococcus, Pseudomonas and Proteus while cefaperazone was sensitive only in 50 % of the cases. Piperacillin + Tazobactum was sensitive in all the isolates of Stryptococcus, Pseudomonas and Proteus while 1 colony of Staphyloccus was found to be resistant. The sensitivity of Amoxicillin+ Clavulinic acid, Ceftriaxone, Aminoglycosides and Fluoroquinolones were very low as compared to Piperacillin + Tazobactum and Meropenam. [Table-4]

Redo surgery was performed in those patients who developed wound dehiscence and abdominal collection in 8 cases (12.9%). Tension suturing was done in 6 cases (9.6%) and stoma formation was done in 2 patient with anastomotic leak (3.2%).[Table-5]

Statistical analysis

Data was compiled using MS excel 2007 and analysis was done with the help of Epi-Info 7 software. Frequency and percentage were calculated & statistical test (Chi Square) was applied wherever applicable; $p<0.05$ was taken as statistically significant.

Discussion

Peritonitis is a well known entity to the surgeons especially in rural parts of the India. Although with the great advancement in surgical techniques and operative facilities, the operative mortality has decreased significantly in past 3 decades but associated morbidity is still high.[1-4] With the advancement in intensive care facilities along with early diagnosis and aggressive surgical techniques, the mortality related to perforation peritonitis has been decreased from 60 % in the past to 10 %.[1-4] Still the morbidity associated with perforation peritonitis is as much as 63 % and most of these are infectious in origin.[5] As there is considerable variation in the etiology of peritonitis along with different antibiotic policies based on clinical experience, the ideal empirical antibiotics with optimum results is still remains a challenge.

Microbial origin of peritonitis has been known since 1887 when Pawlowsky demonstrated the microbial origin of peritonitis by injecting the intestinal content into the intestine.[6] Later on it have been found that the bacterial flora in patients with perforation peritonitis is to a larger extent composed of microorganisms which have been isolated from the intestinal tract of man.[7] There are significant variation in the type of bacterial flora, degree of septicemia anatomical site and causes of perforation peritonitis. Even after advent of proton pump inhibitors, still the most common causes of perforation peritonitis are perforated duodenal ulcer and ileal perforation associated with typhoid fever in India. Large bowel perforations and malignant perforations are less common as compared to the western countries. In western countries perforations are seen mostly in the distal part. In our study highest number of perforations were noticed in ileum (38.7%) and duodenum (29%) followed by gastric and appendicular (9.6 % each) Large bowel perforations were present only in 6.4% of the cases. Peptic ulcer disease was associated with 38.7 % of the cases followed by Typhoid fever (22.5%),appendicitis (9.6%), Tuberculosis (6.4 5), idiopathic stricture and band (6.4%), trauma (6.4 %), obstructed hernia and mesenteric ischemia in 3.2 % each. In this study, most common organism was E. coli 26 (%) followed by Klebsiella 10 (%) and staphylococcus aureus 4(%). Streptococci, Pesudomonas and proteus isolated in 2 cases each. E coli and Klebsiella were found to be sensitive to Meropenam in all the cases while sensitivity to Piperacillin + Tazobactum is almost 91 % and 90 % respectively. Sensitivity to Cefaperazone was about 66 % in E. Coli isolates, 75% for Ceftazidime while for Klebsiella 60 % and 80 % respectively. Meropenam was sensitive in all the isolates of Staphyloccus, Streptococcus, Pseudomonas and Proteus while cefaperazone was sensitive only in 50 % of the cases. Piperacillin + Tazobactum was also sensitive in all the isolates of Stryptococcus, Pseudomonas and Proteus while 1 colony of Staphyloccus was found to be resistant. The sensitivity of Amoxicillin+ Clavulinic acid, Ceftriaxone, Aminoglycosides and Fluoroquinolones were very low as compared to Piperacillin + Tazobactum and Meropenam. Kumar et al in their study over antimicrobial susceptibility patterns of organisms causing secondary abdominal infections in patients with perforated abdominal viscus recorded the most common organism isolated in the intraoperative fluid was Escherichia coli (47.9%) followed by Klebsiella pneumoniae (12.5%). On antibiotic sensitivity, amikacin, piperacillin-tazobactam and imipenem were found to be more sensitive than cefoperazone-sulbactam in isolates of E. coli and K. pneumoniae. Based on their study,they recommended piperacillin-tazobactam or imipenem as a antibiotics used empirically in patients presenting with complicated intra-abdominal infections secondary to perforated viscus, especially if they have sepsis or septic shock.[8] In other study conducted on perforated appendicitis with peritonitis has reported that E. coli and Bacteroides fragilis as a most common organism isolated from peritoneal fluid and were sensitive to sensitivity to imipenem, amikacin and piperacillin-tazobactam. High bacterial load in the intraoperative fluid might be the reason for the therapeutic failures associated with patients with perforation. In their study, cefoperazone-sulbactam was the most commonly used empirical agent but it has shown sensitivity to E. coli in only 5 (out of 23)

cases.[9] Piperacillin-tazobactam and imipenem were found to be sensitive against anaerobic organism also and these two antibiotics need not be given with metronidazole.[10-12]. They also reported that the organism isolated in blood culture were different from the organism isolated from intraoperative fluid and it was unlikely to be the migration of organism to blood stream which later leads to septic infections in other organs of the body. They also suggested the use of piperacillin-tazobactam or imipenem in patients presenting with complicated intra-abdominal infections secondary to perforated viscus, especially if they have sepsis, and imipenem if the patient is in septic shock. [9]One of the most common causes of morbidity and prolonged hospital stay and redo surgeries is surgical site infections leads to septicemia. [13,14] It is not uncommon to have patients of perforation peritonitis presented with septicemia and shock due to delayed especially in rural areas in India. Although surgical intervention is the mainstay of treatment of underlying pathology but optimum treatment should be to complement it with appropriate antibiotics based on antibiotic sensitivity of the organisms isolated from the peritoneal cavity and it should be stated as early as we diagnose the disease. Inappropriate empirical treatment is associated with poorer outcome irrespective of type of surgery performed. [15]Most of peptic ulcer perforation was managed by Graham patch omentopexy 24 (38.6 %). Small bowel perforations were managed by only stoma 18 (29 %) and primary repair 6 (9.6 %). Resection and anastomosis was 8 (12.9%) in patients present with multiple small bowel perforation, appendicectomy 6 (9.6%). Yadav et al in their study over spectrum of perforation peritonitis in India also noticed the commonest cause of perforation was perforated duodenal ulcer (26.4 %) and ileal typhoid perforation (26.4 %) followed by tubercular (10.3 %) and appendicular perforation (5 %). Ileum (39.1 %) was the most common site of perforation followed by duodenum (26.4 %) stomach (11.5 %) and appendix (3.5 %). Jejunum was perforated on4.6 % and colon only in 3.5 % of the cases.[14] Though the incidence of typhoid and tubercular perforations are decreasing in the western world but in developing countries like India it still counts for about 50% of the total perforations whereas infections constitute only 2–3% of all cases in the western world.[16]Most studies have shown that suture site infections are the most common post-operative complication which is also associated significantly with post-operative morbidity.[1,13,14] Studies had also shown that methodology of wound closure has no significant impact on incidence of wound infection [13]. Although antibiotic alone is not only a factor to control a sepsis as immunity of the patient also plays a crucial role but the early initiation of appropriate antibiotic therapy helps in decreasing the bacterial load, can localize the infection and leads to less post operative wound infections, redo surgeries and mortality.[13] Once infectious complication has been established, the drainage of the collections with administration of appropriate antibiotics will be the core therapy in the postoperative period.

Conclusion

The present study demonstrates that peptic ulcer perforation and ileal perforations due to typhoid fever are still a common cause of perforation in this region. Most common organisms cultured from peritoneal fluid were E. coli and Klebsiella.

Piperacillin + Tazobactum and Carbepenam were sensitive in most of the isolates and might be started in patients with perforation peritonitis as a empirical antibiotic therapy.

What this study add to existing knowledge

It is important that in future, local data are considered for making antibiotic policies for a particular setting and these must be updated regularly. The present study states that the combination of third generation cephalosporins and aminoglycosides were found to be less sensitive to the microflora of our region in patients with perforation peritonitis. Piperacillin + Tazobactum and Carbepenam were sensitive in most of the isolates and might be started in patients with perforation peritonitis as a empirical antibiotic therapy but should be used judiciously on case basis.

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