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ORIGINAL RESEARCH

Clinicobacterial Study of Perforation Peritonitis and its Impact on Postoperative Wound Complications

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ABSTRACT

Background:Surgical wound infection continues to consume a considerable portion of health care finance. Even though the complete elimination of wound infections is not possible, a reduction of observed wound infection rate to a minimum level could have marked benefits in terms of both patients comfort and resources used .As many surgeons believe that routine culture of peritoneal fluid in patients of secondary peritonitis offer no useful information & no clinical benefits, not too many studies had been done to support the utility of peritoneal fluid culture as a important parameter in preventing SSI.. This study was aimed to study relevance of peritoneal fluid culture in relation to its impact on surgical site infections and to know the most common organism associated with peritonitis & SSI with their antibiotic sensitivity in our hospital. Also to know if any correlation present between organism isolated from peritoneal fluid & organism isolated from pus from wound.

Materials and Methods: A prospective & correlational study was conducted on 100 patients undergoing emergency laparotomy for perforation peritonitis. Samples from peritoneal fluid intraoperatively and discharge from infected post operative wound collected using a sterile swab and studied for identification of isolates by Gram stains and culture growth followed by in vitro antibiotic susceptibility testing performed by disc diffusion method.

Results: SSI was more in Patients having positive peritoneal fluid culture (77.6%) but no positive correlation was found between the organism isolated from peritoneal fluid & organism isolated from pus from wound. E.coli was the most common organism isolated from peritonealfluid(75.8%) &klebsiella was the most common organism associated with surgical site infections(81.2%) in patients undergoing emergency laparotomy for perforation peritonitis & is resistant to most of the antibiotics supplied in our hospital set up.

Conclusion: Though the incidence of SSI was more in Patients having positive peritoneal fluid culture but no positive correlation was found between the organism isolated from peritoneal fluid & organism isolated from pus from wound that means organism associated with peritonitis was later on not found to be causing SSI in the same patients. Routine culture & sensitivity of peritoneal fluid just give spectrum of data for starting antibiotics in early post- op period.

Keywords: Routine Culture & Sensitivity, Peritoneal fluid, Antibiotics, Surgical Site Infection [SSI].

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INTRODUCTION

As many surgeons believe that routine culture of peritoneal fluid in patients of secondary peritonitis offer no useful information & no clinical benefits, not too many studies had been done to support the utility of peritoneal fluid culture as a important parameter in preventing SSI. This study was done to study relevance of peritoneal fluid culture in relation to its impact on surgical site infections.

Surgical wound infection continue to consume a considerable portion of health care finance. Even though the complete elimination of wound infections is not possible, a reduction of observed wound infection rate to a minimum level could have marked benefits in terms of both patients comfort and resources used.[1] This initial principles help to change surgical therapy from a dreaded event, with infection and death commonplace, to one that elevates suffering and prolongs life with predictable success when carefully performed.

With the introduction of antibiotic therapy in the middle of the 20th century a new adjunctive method to treat and prevent surgical infections was fostered. However, not only have postoperative wound and hospital acquired infections continued, but wide spread antibiotic therapy has often made prevention and control of surgical infections more difficult. The present generations of surgeons has seen increasing number of serious infections related to a complex combination of factors, including the performance of more complicated and longer operations and increase in number of patients with accompanying chronic or debilitating diseases.

The modern surgeon cannot escape the responsibility of dealing with wound infections and in dealing with them, of having a knowledge for appropriate use of aseptic and antiseptic technique, proper use of prophylactic and therapeutic antibiotics, and adequate monitoring and support with novel surgical and pharmacologic as well as non pharmacological aids. Basic understanding of how the body defends itself against infection is essential for a rational application of surgical and other therapeutic principles to the control of infections.[2]

MATERIALS & METHODS

The study was conducted at Dept. of Gen. surgery Hamidia Hospital, Gandhi Medical College,Bhopal during the period of December 2012 to December 2013. . The study was carried out in accordance to Declaration of Helsinki, institutional ethical guidelines and as per Indian Council of Medical Research (ICMR).

Study Population All consecutive patients (age >12 years) undergoing emergency laparatomy for perforation peritonitis in department of Gen. surgery Hamidia Hospital, Gandhi Medical College,Bhopal during the period of December 2012 to December 2013 Total number of patients included in the study is 100.

Inclusion criteria: Case will be included according to wound infection definition given in Oxford textbook of Surgery.

Exclusion criteria: Wound site previously infected will be excluded, Patients withassociateddiseasessuchasdiabetes,anaemia,HIV,steroid medications are excluded.

Method of Collection of Data: All patients fulfilling the inclusion criteria were included in the study. Relevant data were obtained from patient interviews, clinical examination and patient records and hospital registers. all patients were given single dose of piperacillin

+tazobacum 4.5gm Intravenous (IV) at induction according to hospital protocol. Intraoperatively 5ml of peritoneal fluid was sent for aerobic culture and antibiotic sensitivity. Postoperatively patients were followed up for a duration of two weeks and assessed for wound infection.. Surgical site was first inspected on post operative day three, thereafter daily. If there is any wound discharge,it was sent to culture and sensitivity with a wound swab.

Surgical site infection was clinically diagnosed when there was serous, non purulent discharge from wound, purulent discharge from wound, signs of inflammation like edema, redness, local rise in temperature, fever >38 C.

Procedure in laboratory: In the microbiology department, the swabs were inoculated onto blood agar plate, McConkey's agarplates and nutrient broth.Inoculated media were incubated aerobically at 37 C for 24-48 hrs. Nutrient broth was sub cultured if the original plates did not yield organisms. The bacteria isolated were identified by their morphological and cultural characteristics.

The samples collected were processed as follows:

Direct microscopic examination of gram stained smear.

Inoculation of the samples onto different culture media for aerobic and anaerobic organisms.

Preliminary identification

Bio-chemical tests

Antibiotic sensitivity

RESULTS

A total of 100 Patients admitted to the Department of General Surgery, Hamidia Hospital, Bhopal were included in the study. 58 Patients whose Peritoneal Fluid Cultures were positive were considered as cases and 42 Patients whose Peritoneal Fluid Cultures were negative considered as controls. An evaluation was undertaken to study the correlation between Peritoneal Fluid Culture and Postoperative wound infection in these two groups.

Table 1: Age Distribution

Age In Years	Cases		Controls	
	No.	%	No.	%
11-20	8	14	9	21
21-30	11	19	15	36
31-40	17	29	10	24
41-50	8	14	4	10
51-60	10	17	3	7
61-70	2	4	1	2
>70	2	4	0	0
Total	58	100	42	100
Mean±SD	33±5		30±5	

Table 2: Gender Distribution

Gender	Cases		Controls	
	No.	%	No.	%
Male	46	79	36	86
Female	12	21	6	14
Total	58		42	

[Table 2] Shows gender distribution of study population. In both groups, Males are predominated.

Table 3: Bacterial Species Isolated From Peritoneal Fluid Culture

Bacterial Isolate	No. of Isolate	% of Isolates
1.E.coli	44	75.8
2.Klebsiella pneumoniae	6	10.4
3.Staph. aureus	0	0
4.Pseudomonas	1	1.8
5.Mixed Growth	7	12
Total	58	100%

Table 4: Bacterial Species Isolated From Post Op Surgical Site Infection

Bactrial Isolate	No. of Isloate	% of Isolates
1.E.coli	04	8.3
2.Klebsiella pneumoniae	39	81.2
3.Staph. aureus	03	6.3
4.Pseudomonas	02	4.2
Total	48	100%

Klebsiella was the most common organism isolated (81.2%) followed by E.coli(8.3%).

Table 5: Postop Wound Infection

Postop Wound Infection	Cases (n=58)		Controls (n=42)	
	No.	%	No.	%
No	13	22.4	39	92.85
Yes	45	77.6	03	7.15
Total	58	100.0	42	100.0

Table 6: Correlation Between Peritoneal Fluid Culture and Post OP Wound Cultue

Microorganism	Peritoneal Culture	Wound Culture	
E.coli	44	4	The Z-Score is 6.6227. The p-value is 0. The result is significant at p <0.05. The proportion of Yes or No responses for Observation 1 is 0.44. The proportion for Observation 2 is 0.04.
Klebsiella	6	39	The Z-Score is -5.588. The p-value is 0. The result is significant at p <0.05. The proportion of Yes or No responses for Observation 1 is 0.06. The proportion for Observation 2 is 0.39
Staph. Aureus	0	3	
Pseudomonas	1	2	
Mixed Growth	7	0	
No Growth	42	52	The Z-Score is -1.4168. The p-value is 0.0778. The result is not significant at p <0.05. The proportion of Yes or No responses for Observation 1 is 0.42. The

			proportion for Observation 2 is 0.52.
Total	100	100	

The study doesn't found a positive correlation between the organism isolated from peritoneal fluid culture and organism isolated from pus from post operative infection.

Shows age distribution of the study population. The study group included 58 cases and 42 controls. Maximum number of patients belong to 30 – 40 years in both groups. Mean age of cases was 33±5 and of control was 30±5. The most common organism isolated from peritoneal fluid culture was E.coli (75.8%) and followed by mixed growth of Klebsiella and E.coli(12%). Other organsims isolated are shown in table.

The overall morbidity and mortality rates were 52% and 16.5% respectively. 78% of patients received inadequate antibiotics preoperatively. Only 26% had appropriate change of antibiotics postoperatively.There was no significant benefit of postoperative change of antibiotics based on culture results. Analysis of factors influencing mortality shows dominance of host related factors over the type and source of infection with high risk population identified by age>60 years, delayed presentations>3 days and APACHE II score>15.

Postop Wound Infection is more associated with cases as compared to controls. Postop Wound infection:45(77.6%) of patients in cases and 3(7.15%) of patients in control group had wound infection. So, Post operative wound infection is significantly more associated with cases as compared to controls

Statistical analysis:

The collected data was summarized by using frequency, percentage, mean &S.D. To compare the qualitative outcome measures Chi-square test or Fisher's exact test was used. To compare the quantitative outcome measures Independent t test was used. If data was not following normal distribution, Mann Whitney U test was used. SPSS version 22 software was used to analyse the collected data. p value of<0.05 was consideredto be statistically significant.

DISCUSSION

Perforation peritonitis is the most common surgical emergency in India. The spectrum of etiology of perforation in Tropical countries continues to be different from its Western counterpart. This is a prospective and correlational type of study of 100 cases that undergone emergency laparatomy for perforation peritonitis.

The most common organism isolated from peritoneal fluid culture was E.coli and followed by mixed growth of Klebsiella and E.coli(12%) and this was consistent with other studies relating to the microbial flora in secondary peritonitis among patients of gastro intestinal perforations.[3,4,5]. Majority of organisms found sensitive to cefoperazone+sulbactum followed by Meropenem and Amikacin. The study found that there was increased incidence of post op wound infection in patients having positive peritoneal fluid culture. This might be due to wound contamination during surgery . Claessonand Holmlund [6] revealedthat5ormoreCFU/mlofbacteriainperitonealfluidwerepredictiveofwoundinfection(infectionratewithoutcontamination,6.4%;withcontamination,41.2%).

Agarwalet al[7],shows that wound infection rate for clean, clean contaminated and contaminated cases is 36.17%, 57.14%, and 100% respectively.In our study SSI rate was high as all surgeries was contaminated and dirty type.Mostcommonorganismencounteredinpostoperativewoundinfectioninthis

studyisKlebsiella,in39casesaccountingfor 81.2% which was different from other studies in which E.coli,Staph.aureus and proteus was common.[7,8,9]

In our study klebsiella is found to be resistant to all antibiotics in >70% cases. Only 9 cases(23%) shows sensitivity to meropenem,cefoperazone+sulbactum & Amikacin.E.coli is found to be sensitive in only 50%cases to Amikacin, Cefoperazone+Sulbactum and Meropenem.Staph.aureus is found to be sensitive in 66% cases to Amikacin ,Cefoperazone+Sulbactum,Meropenem,Linezolid and Impenem+Cilastatin.

Ramakrishnaiah VP et al did an audit with special reference to peritoneal fluid culture in cases of community acquired secondary bacterial peritonitis in a tertiary hospital of South India.Gastroduodenal perforations formed the major site of perforation (51%), followed by small bowel (29%) and appendicular perforations (17%). Culture positivity rate was 64%. Escherichia coli and Klebsiella species were the predominant isolates from peritoneal fluid. These main isolates were predominantly sensitive to ceftazidime, amikacin and chloramphenicol. Ampicillin with gentamicin and metronidazole was the first line of treatment used preoperatively in 67% of the patients, given its low cost and easier availability.[10]Thisfindingfurthersupportsthewellknownhighprevalenceofmultipleantibioticresistantnosocomialpathogensinourenvironmentandmayreflectthewidespreadabuseofantibioticsinthegeneralpopulation.

In a single-center retrospective study, Jang JY et al studied epidemiology and microbiology of secondary peritonitis caused by viscus perforation.Complicated intra-abdominal infections are serious conditions that require urgent source control and antibiotic treatment. The purpose of this study was to evaluate the epidemiology and bacterial causation of such infections using blood and peritoneal cultures of Korean patients with peritonitis originating from viscus perforation. The most common perforation site was the colon (165; 39.4%), and the overall mortality rate was 11.2%. Blood cultures were performed in 182 patients, and 20 patients (11.0%) had a positive culture. Blood culture positivity was significantly higher for colon perforations .Enterococcus faecium (35.2%) was the most common gram-positive bacterium, and Escherichia coli was the most common gram-negative organism.The compositions and antibiotic resistances of micro-organisms found in this study are similar to those reported previously.[11]

Davies HO et al did peritoneal fluid culture in appendicitis andreview in changing times.The authors concluded that an appropriately powered randomised, blinded, prospective, controlled clinical trial is needed to test for absolute efficacy in the use of peritoneal swabs in patient management. Until controlled trial data becomes available, it may be wise to continue peritoneal swabs at least in high-risk patients to decrease clinical and medicolegal risk.[12]

Lepänluoma M et al postulated that surgical safety checklist is associated with improved operating room safety culture, reduced wound complications, and unplanned readmissions in a pilot study .The objective ofstudy was to assess the impact of the implementation of the checklist on safety-related issues in the operating room and on postoperative adverse events in neurosurgery.Communication between the surgeon and the anesthesiologist was enhanced, and safety-related issues were better covered when the checklist was used. Unplanned readmissions fell from 25% to 10% after the checklist implementation ($p = 0.02$). Wound complications decreased from 19% to 8% ($p = 0.04$). The consistency of documentation of the diagnosis and the procedure improved. The use of the checklist improved safety-related performance and, contemporarily, reduced numbers of wound complications, and readmissions were observed.[13]

We didn'tfind apositivecorrelationbetweentheorganism isolatedfromperitoneal fluidandorganismisolatedfrompusfromwound. The reason behind these SSI are may be nosocomial infections through air-borne organism,inanimate objects(table,beds,dressing material etc .) or through medical staff .

CONCLUSION

Present study clinico bacterial study of perforation peritonitis and its impact on post-op wound complications was conducted in Department of Surgery, Hamidia hospital, on completion of this study and after evaluation of results and observations following conclusions were drawn

1. E.coli was the most common organism isolated from peritoneal fluid(75.8%) & is sensitive to cefoperazone+sulbactum, meropenem& amikacin in >70% cases.
2. Klebsiella was the most common organism associated with surgical site infections(81.2%) in patients undergoing emergency laparotomy for perforation peritonitis & is resistant to most of the antibiotics supplied in our hospital set up. In few cases it is found sensitive to cefoperazone+sulbactum, meropenem, & amikacin.
3. Though the incidence of SSI was more in Patients having positive peritoneal fluid culture but no positive correlation was found between the organism isolated from peritoneal fluid & organism isolated from pus from wound that means organism associated with peritonitis was later on not found to be causing SSI in the same patients. Routine culture & sensitivity of peritoneal fluid just give spectrum of data for starting antibiotics in early post- op period

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