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Original article:

Whether culture positivity and Perforation-operation interval affects mortality in perforation peritonitis ? : Experiences of a Rural Medical College

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Abstract:

Background & objectives : The endeavour was to study the microbial profile in a rural medical college hospital having a small gestational existence of eight years and to study the correlation of mortality to various organisms and perforation-operation interval (PO).

Methods: Two hundred and seventy six cases of perforation peritonitis were studied in eight years for the microbial pattern isolated from peritoneal fluid during exploratory laparotomy. The presence or absence of organisms were compared to the mortality of patients. The relationship of mortality, to the PO interval was compared for any statistical significance.

Results: Out of two hundred and seventy six cases 130 cases yielded positive culture and 146 yielded negative culture. The mortality rate in culture positive cases was 25.38 % whereas it was 4.1 % in culture negative cases. The mortality rate in culture positive patients presenting within 24 hours was 23.63% whereas the mortality rate in culture positive patients presenting more than 24 hours was 26.66%.

Conclusions: PO interval and culture positivity of the peritoneal fluid has a direct bearing on mortality of patients with non traumatic perforation peritonitis. The mortality is more as PO interval increases as also the culture positivity of peritoneal fluid.

Keywords: peritonitis, perforation-operation interval, mortality, microbial

Introduction:

Peritonitis is a common condition encountered in surgical practice worldwide and commonly occurs in intra abdominal viscus perforation. Surgical textbooks worldwide describe stages in peritonitis, which is the response of the body to limit infection. The peritoneum responds to the perforation by hyperemia and transudation of interstitial fluid into the peritoneal cavity This transudate is rich in fibrin and plasma proteins which helps to confine the contamination. The presence of bacteria within the peritoneal cavity does not invariably lead to diffuse spreading peritonitis and in most instances the transudation of fluid in the peritoneal cavity leads to limitation of the inflammatory process and limiting the infection. It is at this stage that a surgical intervention is essential so as to have a minimal mortality as failure to do so invites

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incessant contamination with failure of the defense mechanisms.(Schwartz)

Innumerable bacterial species form a mixed ecosystem in the human gastrointestinal tract. The microorganisms vary according to the region of the gastrointestinal tract. The gastroduodenal region contains relatively few microorganisms, mostly representating Gram-positive facultative microorganisms such as Lactobacilli, Streptococci and Candida . The microbial density increases towards the ileum containing Eschericha coli, Enterococci and an equal number that are obligate anaerobic organisms, such as Bacteroides fragilis. Further ahead in the colon, obligate anaerobes, such as Bacteroides, anaerobic Streptococci, and Clostridiums predominate, and far outnumber the mostly aerobic bacteria.[1]A delay in intervention due to a increased PO interval leads to the risk of unlimited bacterial proliferation with associated risk of polybacterial infection. This study also intends to analyse whether polymicrobial infection, culture positive peritoneal fluids and increased PO interval increases the mortality.

Material and Methods :

Peritoneal fluid samples of all patients undergoing exploratory laparotomy for perforation peritonitis were collected intraoperatively and subjected to culture and sensitivity tests. The samples were divided into turbid and non turbid arms. The non turbid fluid was examined using Bac- t alert. Only colonic perforations were subjected to anaerobic culture. Traumatic perforations were excluded. The fluid was first subjected to Gram and Z N staining and then culture was done using blood agar and Mac-Conkey medium for 48 hours at 37^0 C. Antibiotic sensitivity was done by disc diffusion method. Anaerobic cultures were not done routinely except in colonic perforations.

Similarly cultures were tabulated for each site of perforation in order to document organisms at various anatomical parts of the gut.A PO interval record of the patients who presented at the hospital were recorded to look for any statistical significance of relationship of positive culture with duration of presentation. Statistical analysis was done using Microsoft Excel and SPSS 22 version. The mortality rate was statistically evaluated for PO intervals of more than and less than 24 hours. Similar evaluation was done to find the correlation between culture of peritoneal fluid and mortality.

Observation:

276 cases of perforation peritonitis were included in this study . 196 were duodenal, 15 were gastric, 7 jejunal, 44 ileal, 9 appendicular and 5 colonic. (Table 1)

In this study gastroduodenal perforations accounted for the majority of perforations with ileal perforation being a distant second.There were one hundred and thirty positive cultures and one hundred and forty six negative cultures. Amongst positive culture seventy seven were from upper gastro intestinal tract whereas forty six were from lower gastro intestinal tract. There were 146 negative culture cases. (Table 2)

The commonest organisms isolated were E Coli , Kleibsella, Citrobacter, Streptococci depending on the site of perforation. (Table 3)The mortality rate in culture positive cases was 25.38 % whereas it was 4.1 % in culture negative cases. On analysis

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of the delay of presentation of patients one hundred and thirty seven patients presented within 24 hours of abdominal pain out of which fifty five patients had a positive culture whereas one hundred and thirty nine patients presented more than 24 hours after complaining of abdominal pain out of which seventy five patients were culture positive. The mortality rate in culture positive patients presenting within 24 hours was 23.63% whereas the mortality rate in culture positive patients presenting more than 24 hours was 26.66% (Table 4) which is statistically significant.In the culture negative group the mortality rate of patients in less than 24 hours group was 3.6% as compared to 4.6% in the more than 24 hours group. (Table 4)There were forty cases of polybacterial infection, maximum in the duodenal and ileal regions.

Discussion:

Perforation peritonitis is a commonly encountered condition in surgical departments. Some patients present early to the centre whereas a substantial number of patients present with a delay due to lack of proper medical facilities in rural areas, inadequate transport facilities and poor socioeconomic conditions. As is common, with bowel perforation, the contaminating organisms are diverse and the infection is frequently polymicrobial. In addition, the composition of microorganisms in abdominal fluid obtained from patients following perforation varies, depending on the location of the perforation. In this series it is observed that the detection of organisms from peritoneal fluid goes on increasing as we progress to the aboral end. This is expected as the proximal gastrointestinal tract (GIT) contains less organisms. But this scenario changes if there is a delay in surgical intervention as secondary infection sets in and a complex polymicrobial infection sets in which alters the mortality.[2] This suggests that the PO interval is an important period wherein mortality could be reduced by reducing the PO interval. The commonest organisms isolated from upper GIT were E Coli and Kleibsella whereas 21 cases showed a polymicrobial infection.[3] This flora is surprisingly consistent across patients and institutions. Due to this and the availability of well-established effective empiric antimicrobial regimens, many surgeons believe that cultures of peritoneal exudates in patients with peritonitis is of limited use.[4]

The commonest sites for perforation were gastroduodenal, ileal and appendicular in that order which matches with that of many asian counterparts.[5,6] However 79% of cases were positive for culture in duodenal perforations in this series due to a delay in presentation to the tertiary care centre. All cases of Ileal and colonic perforations showed culture positivity suggesting the high commensals in this part of the GIT. However, growth characteristics, adherence capacities, and the virulence of certain species and host defenses explain why only a small number of bacterial species, approximately four to six out of the 400 different species, are isolated from the peritoneal exudate. By far, the most commonly isolated two organisms are E. coli and the obligate anaerobe, B. fragilis.

Culture of peritoneal fluid revealed a total of 132 positive cultures and 146 negative cultures out of which mortality was seen in 33

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and 6 cases respectively which on statistical analysis is significant. [7] Some series have a very high isolation of Bacteroides group predominantly in the colonic perforation group however this series had a predominant upper GIT perforations.[8]The other significant factor is the time of presentation to the tertiary care centre after the commencement of symptoms. A delay in presentation is surely going to affect the mortality due to various factors out of which a mono to polymicrobial conversion occurs significantly. In this series we divided the patients into those who presented less than and more than 24 hours after the commencement of symptoms. They were subdivided into culture positive and negative cases. The statistical analysis showed that irrespective of PO interval, mortality is high in culture positive cases as compared to culture negative cases. [9]

Conclusion:

We conclude with the observation that in non traumatic perforation peritonitis the PO interval is quite significant as a reduction in PO interval reduces the pathogenicity of peritoneal fluid hence reducing the mortality and minimizing the use of costly antibiotics.

Table 1 : Distribution of perforation sites.

Site	Percentage
Duodenum	196 (71.01 %)
Gastric	15 (5.43 %)
Jejunal	7 (2.53%)
Ileal	44 (15.94%)
Appendicular	9 (3.26%)
Colonic	5 (1.81%)
Total	276

Table 2 : Culture Distribution.

Organ	**Positive Culture**	**Mortality**	**Negative Culture**	**Mortality**
Duodenum	76	18	121	06
Gastric	03	01	12	00
Jejunal	07	04	01	00
Ileal	35	08	09	00
Appendicular	06	00	03	00
Colonic	05	02	00	00

Proportion of mortality in positive culture = 0.25 ; Proportion of mortality in negative culture = 0.041.

95% confidence interval for difference: 0.1504 to 0.2676. z = 6.868; P = 0.000.

Total proportion of mortality in positive culture is significantly more than in negative culture.

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Table 3 : Distribution of organisms and their sites.

ORGANISM	GASTRIC	DUODENUM	JEJUNUM	ILEUM	APPENDIX	COLON
Citrobacter freundi	-	01	-	-	-	-
E Coli	01	18	01	14	04	02
Kleibsella	-	23	02	01	-	01
Streptococci	-	09	-	02	-	-
Candida	-	-	-	-	-	-
Polybacterial		21	04	11	02	02
Staphylococcus		02		-		
Pseudomonas		02		-		
Total	01	76	07	35	06	05

Table 4 : Mortality.

PO Interval	Culture Positive	Mortality	Culture Negative	Mortality	Significance
Less than 24 hours	55	13	82	03	Z = 4.621, p = 0.000
More than 24 hours	75	20	64	03	Z = 4.877, p = 0.000

Irrespective of PO interval proportion of mortality in culture positive cases is significantly more than culture negative cases.

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