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A Prospective Observational Study on Peritoneal Fluid Culture and Its Antibiotic Sensitivity in Perforation Peritonitis Cases

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ABSTRACT
AIM-To study peritoneal fluid culture and its antibiotics sensitivity in perforation peritonitis cases at SMS Hospital, Jaipur.
METHODS- patient presenting to the emergency department of SMS hospital,Jaipur with hollow viscous perforation ,above 14 years of age ,were planned for exploratory laparotomy and the peritoneal fluid collected was sent for microbial culture and sensitivity.
RESULTS- This study showed most common site of perforation as ileum,followed by stomach. The most common bacteria grown was E.coli followed by Klebsiella and Pseudomonas in order. Most of the organism were sensitive to Tigecyclinefoloowed by Imipenem and Amikacin and approximately 50% showed sensitivity to Piperacillin and Tazobactum.
CONCLUSION- This study showed that, micro-organism at SMS hospital are showing sensitivity to higher antibiotics like Tigecycline, Imipenem, and are resistant against commonly used antibiotics like Cephalosporin group of drugs, Ciprofloxacin, Ceftazidime, Cefepime, cotrimoxazole, cefotaxime, Ampicillin.

KEYWORDS
Perforation peritonitis, peritoneal fluid culture, antibiotic sensitivity, Tigecycline, Imipenem, Amikacin

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I. INTRODUCTION

Peritonitis is a common emergency in surgical practice. Peritonitis can be classified as primary Peritonitis, due to haematogenousdissemimation , secondary Peritonitis due to perforation or trauma and tertiary peritonitis due to persistent infection after adequate therapy(2). Secondary peritonitis is most common form of peritonitis(1). Patient presents with pain abdomen, vomiting, constipation, fever, abdominal distention and clinical signs like guarding, rigidity and tenderness can be elicited. Diagnostic modality used for perforation peritonitis cases are x-ray abdomen which shows gas under the diaphragm and ultrasound which shows presence of free air or fluid with altered echogenecity. Appropriate antibiotic therapy when adopted for secondary peritonitis cases can result in better patient outcome . Although selection of an appropriate agent can be challenging because of the emerging resistance of target organisms to commonly prescribe antibiotics (3) Understanding pathological and other microorganism pattern in case of secondary peritonitis is helpful in selecting appropriate antibiotic therapy.

II. MATERIALS AND METHODS

Detailed clinical history of the patient was taken. Clinical examination and relevant investigations like Hemoglobin, chest x-ray, ecg, abdominal x-ray were done and decision to operate was taken and midline laparotomy was done in such cases. The peritoneal fluid obtained on opening abdomen was sent for culture and sensitivity. Culture was done aerobically on MacConkey agar, blood Agar and chocolate Agar .The organism isolated was tested for antimicrobial senstivity by using Kirby bauer disc diffusion method against following antibiotics, Ampicillin, Pipracillin+Tazobactum, Cefepime, Vancomycin, Gentamicin Doxycycline, Linezolid, Ciprofloxacin, Cotrimoxazole, Clindamycin , Cefoxitin, Teicoplanin, Erythromycin, Polymixin B, Tigecycline,

Impenem, Aztreonam, Colistin, Amikacin, Ceftazidime, Cefotaxime, Cefoperazone+Sulbactum, Tobramycin, Minocycline, Meropenem, Ertapenem, Nitrofurantoin.

The study was approved by institutional research review board and ethics committee.
This prospective study included patients admitted for secondary peritonitis from December 2021 to December 2022 at SMS Hospital Jaipur .Culture sensitivity analysis was done for peritonial fluid obtained intra operatively.
Clinicomicrobiological profile was analysed in patient with perforation peritonitis.

Inclusion criteria and exclusion criteria

Inclusion criteria

All diagnosed cases of perforation peritonitis involving any segment of gastrointestinal tract by any diagnostic modality (USG, CT-abdomen, X-ray abdomen) were included.
Patient found to have perforation intraoperatively and have contamination fluid
present were also included.

Exclusion criteria
Patient less than 14 years of age were excluded.

III. Observation And Results

Ageand gender distribution

Thisstudyshowthatmostcommonageofpresentationis61to70yearsofagewithmaleis tofemale ratio2.1:1 andmeanage ofpresentation was 47.12years ofage.

AgeDistribution		
S.No	AgeGroup	No of Cases
1	15-20	8
2	21-30	15
3	31-40	15
4	41-50	17
5	51-60	16
6	61-70	21
7	71-80	6
8	81-90	2

Duration of symptoms

Thisstudyshowthatmostofthecasespresentedtousafter3rddayofsymptomswhich is 24% followed by4thdayofsymptoms which is 17%.

Meanduration of symptoms was 3.4 days.

Duration ofsymptoms		
S.No.	Day	No ofCases
1	1	17
2	2	12
3	3	24
4	4	17
5	5	16
6	6	14

Site of perforation
Accordingtothestudymostcommonsiteofperforationwasileum43%followedbygastric28%.

Mostoftheduodenumandgastricperforationcaseswereduetopepticulcerdiseasesequel.

11% of the cases were colonic perforation and 6% of the cases were appendicular.Jejunum accounted for 4%of the cases and duodenum 3%.

	Siteof Perforation	
S.No	Site	No of Cases
1	Gallballdder	5
2	Gastric	28
3	Ileum	43
4	Duodenum	3
5	Jejunum	4
6	Colon	11
7	Appendix	6

Organism grown
Inour study out of 100 casesthe most common organismgrownisE.coli42%followed by Klebsiella 12% and Pseudomonas 7% . There was no growth in about25% ofthecases.

In6cases therewas mixedgrowth oforganisms.

CulturedOrganism		
S.No.	NameofOrganism	No ofCases Grown
1	Burkholderia	1
2	E.Coli	42
3	Klebsiella	12
4	Pseudomonas	7
5	Diptheroids	1
6	Enterobacter	4
7	Enterococcus	2
8	Candida	2
9	CoagulaseNegativeStaphylococcus	4
10	Proteus mirabilis	2
11	Acinetobacter	2
12	E.coli+Pseudomonas	3
13	E.coli+Pseudomonas+Proteus mirabilis	1
14	Enterobacter+Proteusmirabilis	1
15	Klebsiella+Psedomonas+E.Coli	1

Organismcultureaccording to thesiteofperforation
ThisstudyshowsthatmostcommonorganismgrowningastricperforationisE.colifollowed byequal incidenceof Klebsiella and Pseudomonas.

InperforationcasesinvolvingduodenummostcommonorganismisE.colifollowedbyEnterobacter.

Jejunumperforationperitonitisshowed mostcommonBacteriaasE.coli,followedbypseudomonas.

ColonicperforationshowedE coliasmostcommon organism.

SimilarlytheperitonealaspiratesfromappendicularperforationrevealedEcoliasmostcommon organism.

Outoffivecasesinvolvinggallbladderperforation3werefoundsterile withremainingshowing Klebsiella and Burkholderiain individualcultures.

Candidawasisolatedintwocases involving gastricperforation.

TherewerefourcultureshowingCoagulasenegativeStaphylococcusaureusincasesinvolvingstomach, ileum and colon perforation.

OrganismandSiteofPerforation								
S. No.	Nameof Organism	Gastric	Duodenum	Jejunum	Ileum	Colon	Appendix	Gall bladder
1	E.Coli	5	2	2	22	8	3	
2	Klebsiella	3			7	1		1
3	Pseudomonas	3		1	2	1	1	
4	Diptheroids	1						
5	Enterobacter		1		1	1		
6	Enterococcus				2			
7	Burkholderia	1						1
8	Candida	2						
9	CoagulaseNegative Staphylococcus	1			2	1		
10	Proteus mirabilis				1	1		
11	Acinetobacter				1			

Organismanddayofperforation

The study showed that most common organism grown during second to third day wasE.coliandmostcommonorganismgrownduring4thto5thdaywasE.colifollowedby Klebsiella. On first day of perforation most of the cultures were negativeforgrowth.Overall mostcommonorganismsgrownwasE.colifollowedbyKlebsiella.

Organismand Dayof Perforation						
S.No.	Nameof Organism	2 day	3 day	4 day	5 day	6 day
1	E.Coli	4	12	7	12	7
2	Klebsiella		2	6	2	2
3	Pseudomonas		2	1	2	2
4	CoagulaseNegative Staphylococcus		2		1	2
5	Acinetobacter			1		1
6	Candida		1	1		1
7	Burkholderia	1				
8	Enterococcus		2			
9	Enterobacter			1	1	
10	Proteus Mirabilis				1	2
11	Diptheroids			1		

Sensitivitypatternforcommonantibiotics

ThisstudyshowsthatE.ColiismostsensitivetoPolymixin-BfollowedbyTigecycline,ImipenemandAmikacininorderandisresistanttoAmpicillinfollowed by cephalosporin group ofdrugs like Cefepime, Cefotaxime, Ceftazidime,Ciprofloxacin,Cotrimoxazole.19casesofE.ColiwereresistanttoPiperacilin +Tazobactum.

KlebsiellawasfoundmostsensitivetoPolymixin-BandTigecyclineandwasresistant to Ampicillin and Cephalosporin group of drugs and was mostly resistant toPiperacillinplus Tazobactum .

Klebsiellaand E.Colishared more orless similardrugsensitivitypattern.

PseudomonaswasfoundmostsensitivetoAmikacinfollowedbyPiperacillin+Tazobactum, Imipenem and Ceftazidimeand Cefipime in orderand wasresistantto Aztreonam and Ampicillin inmost cases.

CoagulasenegativeStaphylococcusAureuswassensitivetoGentamycin,Vancomycin,Ampicillin,Cefepime,Ciprofloxacin,Cotrimoxazole,Doxycycline,Linezolid,Teicoplanin,Clindamycin.

Enterobacter species were sensitive to Polymixin- B, Tigecycline, and Amikacin, andwereresistanttoAmpicillin,Cefoperazone+Sulbactum,Ceftazidime,Cefepime,Ciprofloxacin,Cotrimoxazole,Gentamycin,Imipenem,Piperacillin+Tazobactum.

Acinetobacter wasnoted sensitive to Polymixin-B, Tigecycline and Minocyline andwasresistanttoPiperacillin+Tazobactum,Amikacin,Ampicillin,Cefepime,Cefotaxime,Ceftazidime,Ciprofloxacin,Cotrimoxazole,Gentamycin,andImipenem.

EnterococcuswassensitivetoLinezolid, Doxycyclineand Vancomycin, Teicoplanin.

BurkholderiawassensitivetoCotrimoxazole,Tigecycline,Ceftazidime,Cefoperazone+Sulbactumand resistant to Vancomycinand Colistin.

Sensitivitypatternfor commonantibiotics

S.No.	NameofAntibiotic	E.Coli		Acinetobacter		CoagulaseNegative Staphylococcus		Entrobacter		Klebsiplla		Pseudomonas		Enterococcus	
		R	S	R	S	R	S	R	S	R	S	R	S	R	S
1	Aztreonam										1	2	1		
2	Vancomicin						3								1
3	Amikacin	13	25	2				1	1	8	3				
4	Ampicillin	35	3	2		1	3	3		11		1	4	2	
5	Cefepime	28	6	2			3	1		9	2		3		
6	Cefoperazone+Sulbactum							2					2		
7	Cefotaxime	28	2	2						8	2		2		
8	Ceftazidime	29	6	2				2		8		1	3		
9	Colistin										1		2		
10	Ciprofloxacin	31	7	2			3	1		9	2	1	2	1	
11	Cotrimoxazole	29	5	2		1	3	1		9	1			2	
12	Gentamycin	14	21	2			4	1		8	3		4		
13	Impienem	5	26	2				1		5	6	1	3		
14	Minocycline		1		1						1		1		
15	Nitrofurantiom		1												

16	Piperacillin+tazobactum	19	17	2		1	1	2		8	1	1	3		
17	Polymyxin-B	0	37		2				3	1	10				
18	Tigecycline	1	36		1				3	1	10				
19	Teicoplanin					1	2							2	
20	Cefoxitin					1	1								
21	Clidamycin					1	2							1	
22	Doxycycline						3								1
23	Erythromicin					1	2							2	
24	Linezolid						3								2

R-RESISTANT S-SENSITIVE

IV. Discussion

This study included 100 cases with hollow viscous perforation. Secondary peritonitiscaused by perforation of hollow viscus is common in emergency department of anyhospital. It has high mortality ratesif timely intervention isnot provided to thepatient or if patient fails to report early(2). A successful outcome depends upon earlysurgicalintervention,sourcecontrolandexclusiveinteroperativeperitoneallavageandappropriate antibiotic therapy(18).

InourstudymaleistofemaleratiowasJEtal. and MetzgerJEtal.(4,5)

Most common organism grown were E .Coli and Klebsiella which is similar to studycarried out byDrMutiibwaEt al. (6)

6 patients had more than one organism culturedwhich wassimilar to study conductbyDr Mutiibwa Et al. (6)

Most common site of perforation was ileum which was similar to study conducted byDrMutiibwa(6)

E. coli and Klebsiellafollowed by Pseudomonas were the most common Peritonealisolateswhichwasconsistentwithotherstudiesrelatingtomicrobialflorainsecondarypetrotinitis amongpatients withgastrointestinal perforation (7,8,9).

Majority of small bowel perforation in developing countries are due to typhoid fever(10,11,12,13).

Metronidazole has been used successfully in the treatment of anaerobic infections andresistanceagainst Metronidazole is low (6).

Aerobic bacterial resistance toantibiotics is on rise andalso varies according topopulationdistribution,theirsocio-economicstatus,healthawarenessandaccessibility to medical care, therefore local epidemology should be considered whiledecidingempirical therapyfor perforation peritonitis cases(6).

The study show that majority of cultured bacteria were sensitive to Polymixin-B,Tigecycline , Imipenem and Amikacin and most of them were resistant to drugs likeCefepime,Cefotaxime, Ceftazidime, Ciprofloxacin,Cotrimoxazole,Ampicillin.

NineteencasesshowingE.Coliinperitonealaspirate,wereresistanttoPiperacillin+Tazobactum, and 8 out of 12 cases showing Klebsiella in aspirate wereresistantto Piperacillin+Tazobactum.

Our study results were similar to the study conducted by Praveen Et al. According tothemthemostcommonsiteofgastrointestinaltractperforationwaslowergastrointestinal tract and the most common organism grown was E.coli followed byKlebsiellaPneumoniae and most of the organisms weresensitive to antibiotics likeAmikacin,Cefoperazone+Sulbactum and Piperacillin+Tazobactum.(19)

V. Conclusion

Peritoneal fluid culture and microbial pattern can prove helpful in improving patientoutcome by reducing sepsis related mortality and morbidity. Performing culture andsensitivity analysis for a specific area prehandedly can prove effective in reducingcomplicationsassociatedtoperforationintheparticulararea.Whileformulatingempirical therapy for patients with secondary peritonitis renal function tests, hepaticfunction tests of patient and adverse effect related to drug have to be kept in mind.From this study, it can be concluded that perforation of gastrointestinal tract mostcommonly involves ileum, followed by stomach. Secondary peritonitis in these caseswas most commonly caused by E.Coli followed by Klebsiella. So during empiricaltreatment these organism have to be specially considered. Both E.Coli and Klebsiellawere sensitive to Polymyxin-B , Tigecycline and Imipenem and Amikacin in most ofthecasesand wereresistant to AmpicillinandCephalosporin group ofdrugs. Thus we would like to summarize that that there is increasing antimicrobial resistance against commonly used antibiotics like Ampicillin, Cephalosporin group of drugs and Piperacillin+Tazobactum. The organisms grown were seen responding only to higher antibiotics like Tigecycline, Imipenem and Amikacin and approximately 50% of the organisms were showing resistance to Piperacillin+Tazobactum.

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