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Original Research Article

An Investigation of the Antibiotic Sensitivity of Peritoneal Fluid Cultures in Cases of Perforative Peritonitis

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Abstract:

Introduction: General surgeons often face peritonitis. Significant advances in the treatment of peritonitis have occurred in recent decades, owing mostly to the use of antibiotics and surgical procedures. The study's aims were to determine the antibiotic sensitivity and resistance pattern of commonly used antibiotics against cultured microorganisms.

Materials and Methods: This research used a cross-sectional design. The study was conducted out in the Department of General Surgery, SCB Medical College and Hospital, Cuttack, odisha. The trial ran from October 2022 until September 2023. This research used a sample of 40 people as participants.

Result: Secondary peritonitis is a frequent consequence of hollow viscus perforations. Because patients may not arrive to the hospital until much later, the death rate is high. The age groups of 31-40 years old and 20-30 years old accounted for the majority of perforation cases in our research. The average age when symptoms first occur is 35.26 years. According to our data, 52% of perforations occur in the second part of the duodenum, with the stomach accounting for 42%. Klebsiella accounted for 46% of the cases, E. coli for 34%, and just 2% were a mix of the two. Our research focuses on analyzing the sensitivity patterns of grown organisms. Ceftriaxone, ciprofloxacin, and amikacin were the most often detected organisms that showed sensitivity.

Conclusion: The research discovered that the duodenum is the most prevalent location of perforation, followed by the stomach. Peptic ulcer disease was the most prevalent cause. The most prevalent bacteria responsible for secondary peritonitis in these individuals were Klebsiella and Escherichia coli, with mixed, proteus, and pseudomonas infections occurring seldom. The most effective antibiotics against Klebsiella and Escherichia coli were cephalosporins, quinolones, and macrolides, in that order of sensitivity.

Keywords: Antibiotic sensitivity, peritoneal fluid culture, and peritonitis.

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Introduction

Perforative peritonitis is one of the most prevalent illnesses seen by surgeons in emergency rooms across the globe, especially in impoverished countries. This condition is very frequent in some countries [1]. Perforation may be caused by a number of reasons, including but not limited to simple duodenal perforation, traumatic perforation, perforated appendix, and pancreatic abscess, all of which can worsen acute pancreatitis. Perforation peritonitis continues to be a substantial source of morbidity and death, independent of the underlying disease. The surgeons who treat it are aware of the horrible and deadly repercussions, which may vary from a minor wound infection to septic shock [2-4].

Some lethal organisms such as E. coli, Klebsiella, Proteus, and enterococci species also contaminate the peritoneal cavity in large quantities, which may result in severe acute respiratory distress syndrome [5]. This is another factor contributing to the severity of peritonitis. The current therapy for peritonitis relies on addressing the underlying cause of the infection, providing antibiotics throughout the body, and enabling supportive measures to avoid sudden infant respiratory distress syndrome [6]. It was revealed that administering antibiotics with an aerobe-specific treatment resulted in a decreased death rate and a larger number of residual abscess forms.

On the other hand, when the treatment was focused at anaerobes, the frequency of abscess forms decreased but the mortality rate remained constant [7]. As a consequence, combination therapy was identified as the most effective treatment. In this research, a variety of organisms found in the peri-

toneal fluid cultures of patients with perforative peritonitis were examined. In addition, the antibiotic sensitivity and resistance patterns of these organisms were studied. The goal of this research was to establish how early and suitable antibiotic treatment may be given to patients who present with perforative peritonitis before surgery. This may enhance the patient's prognosis [8-10].

The study's goal was to examine bacteriological and sensitivity patterns in peritoneal fluid in the setting of perforative peritonitis and the appropriate empirical antibiotic treatment. An research was done to determine the antibiotic sensitivity and resistance pattern of routinely used antibiotics to organisms grown in culture.

Material and Methods

This research used a cross-sectional design. The study was conducted out in the Department of General Surgery, SCB medical college and Hospital, Cuttack, Odisha, India. The trial ran from October 2022 until September 2023. This research used a sample of 40 people as participants.

Inclusion Criteria:

- Perforated peritonitis verified by x-ray.
- Over 18 years old.

Exclusion criteria

- Include primary peritonitis and traumatic peritonitis.

Method

This was followed by conventional procedures such electrolyte and creatinine testing, electrocardiograms, blood sugar and urea levels, and serum creatinine. After stabilizing the patient's vital signs and confirming the diagnosis of perforation peritonitis, he was resuscitated with IV fluids and prepped for an emergency laparotomy. The procedure was conducted after the patient and their caretakers gave their consent. The patient received intravenous fluids and antibiotics as part of their normal postoperative treatment after surgery. Following a review of the peritoneal fluid culture reports, we tested the isolated organisms for antibiotic sensitivity using the Kirby-Bauer disc diffusion technique with ampicillin, amikacin, ciprofloxacin, ceftriaxone, and cotrimoxazole. The antibiotics used were determined by the sensitivity pattern of the organisms grown in the culture.

Result

In our research, the age group with the most perforation instances was 31-40 years old, followed by 20-30 years old. The average age when symptoms first occur is 35.26 years. According to our data, 52% of perforations occur in the second part of the duodenum, with the stomach accounting for 42%. Klebsiella accounted for 46% of the cases, E. coli for 34%, and just 2% were a mix of the two. Our research focuses on analyzing the sensitivity patterns of grown organisms.

Table 1: Patient Age Distribution

Sr. No.	Age	Number
1.	20 to 30 yrs	10
2.	31 to 40 yrs	15
3.	41 to 50 yrs	10
4.	>50 yrs	5

This study demonstrates that the age group most frequently observed in the data falls within the range of 31 to 40 years, with a total of 15 cases. This is followed by the age group of 20 to 30 years, which has 10 cases, and the age groups of 41 to 50 years and over 50 years, each with 10 and 5 cases respectively.

Table 2: Gender Distribution

Sr. No.	Gender	Number
1.	Male	35
2.	Female	5

The study's sex distribution reveals a higher incidence of perforation in males (35) compared to females (5). This finding is similar to the majority of the related investigations.

Table 3: The length of time the sickness

Sr. no.	Symptoms (Days)	Cases (no)	%
1.	<1 day	02	5%
2.	2-4 days	32	80%
3.	>5 days	06	15%

The findings of our study indicate that most patients sought medical attention within a period of 4 days after the onset of symptoms. 5% of the patients exhibited symptoms on the initial day, 80% displayed symptoms during a span of 2 to 4 days, and15% of the patients' presented symptoms after 5 days following the commencement of symptoms.

Table 4: Dispersion of the perforation location

Sr. no.	Perforation (Site)	Cases (no.)	%
1.	Gastric	15	37.5
2.	Duodenal	20	50.0
3.	Ileum and colon	5	12.5

In this study it has been found that gastric and duodenal perforations had an identical frequency, however duodenal perforation is somewhat more prevalent at 50.0%, followed by gastric perforation at 37.5%. Ileal and colonic perforations occur at a rateof 12.5%.

Table 5: Cultured organisms in peritoneal fluid

Sr. no.	Microorganism	Cases (no.)	%
1.	Klebsiella	20	50.0%
2.	E. coli	15	37.5%
3.	Proteus	1	2.5%
4.	Pseudomonas	2	5.0%
5.	Klebsiella+ E.coli	1	2.5%
6.	No growth	1	2.5%

Among the 40 cases sent for peritoneal fluid culture at our hospital, the results showed that 20 cases (50%) had growth of Klebsiella, 15 cases (37.5%) had growth of E Coli, 2cases (5%) had growth of Pseudomonas, 1 case (2.5%) had growth of Proteus, 1 case (2.5%) had mixed growth of E Coli and Klebsiella, and 4 cases had no growth. In our investigation conducted at the hospital, Klebsiella was the most often identified organism in the cultures, followed by E. coli.

Discussion

Secondary peritonitis is a frequent consequence of hollow viscus perforations. Because patients may not arrive to the hospital until much later, the death rate is high. In our research, the age group with the most perforation instances was 31-40 years old, followed by 20-30 years old. The average age when symptoms first occur is 35.26 years. According to our data, 52% of perforations occur in the second part of the duodenum, with the stomach accounting for 42%. Klebsiella accounted for 46% of the cases, E. coli for 34%, and just 2% were a mix of the two. Our research focuses on analyzing the sensitivity patterns of grown organisms. Ceftriaxone, ciprofloxacin, and amikacin were the most often detected organisms with sensitivity [11–13].

The most frequent kind of perforation is duodenal perforation, which is followed by stomach perforations. The most common species detected in these instances are Klebsiella (54%), Escherichia coli (34%), pseudomonas (4%), and proteus (2%). Meropenem is the most effective antibiotic against E. coli and Klebsiella in 24% of cases, followed by amikacin 20%, ceftriaxone 18%, ciprofloxacin 12%, and amoxicillin 6%. Klebsiella and Escherichia bacteria are responsive to meropenem, ceftriaxone, amikacin, ciprofloxacin, and amoxicillin [14, 15].

Patients presenting with perforation peritonitis in our research were typically between the ages of 20 and 50, with a peak in the 20- to 30-year-old group. Presenting with an average age of 36. The average age of presentation in that research was 32 years lower than ours. Most instances of perforation peritonitis may be identified with a clinical examination and an abdominal X-ray; however, in a limited percentage of cases, ultrasonography and CT scans are useful. According to the findings of this research, the colon had the lowest risk of perforation peritonitis, followed by the ileum, stomach, jejunum, and appendix. According to Noon et al. [16-18], 210 of 430 patients with gastrointestinal perforation were caused by penetrating trauma, 92 by appendicitis, and 68 by peptic ulcers. Khanna et al., researchers from Varanasi, examined 204 consecutive episodes of gastrointestinal perforation and found that typhoid caused more than half of them. In addition, many had perforations caused by TB, amoebiasis, appendicitis, and duodenal ulcers [19]. These figures, together with the high probability of typhoid-induced perforation, highlight the importance of infestation and infection in the impoverished world. When the authors of the present research compared the two, they determined that the incidence of duodenal ulcer perforation was nearly five times that of stomach ulcer perforation. Other studies reported a ratio closer to 7:1. Most of the patients who tested negative for growth in the culture arrived at our clinic within a day or two of experiencing their first perforation symptom, and peritoneal fluid examination revealed Monomicrobial growth in 80% of cases, polymicrobial growth in 3%, and no growth at all in 17% of cases [20-23].

Klebsiella was the most common Gram-negative bacterium in 52% of the cases, followed by

E. coli was found in 36% of cases, with a combination of the two occurring in 5%. Proteus and Pseudomonas were found in the remaining cases [24, 25]. Over 87% of the gram-negative bacteria examined in this research were susceptible to amikacin,

Cipro floxacillin, and ceftriaxone, whereas ampicillin and cotrimoxazole were resistant. In 76% of instances, minocycline and Linezolid were shown to be microorganism sensitive. Staphylococcus aureus, which was identified in around 8% of the fluid, was responsive to linezolid or minocycline but resistant to penicillin, erythromycin, or cephalexin [26–28]. The duodenum and stomach are the most common locations of perforation, according to the statistics. Klebsiella was the leading cause of secondary peritonitis in these individuals, followed by E. coli and, less commonly, mixed flora, proteus, and pseudomonas. Research found that cephalosporins, quinolones, and macrolide antibiotics were the most efficient against Klebsiella and Proteus [29-31].

Conclusion

This research shows that perforation occurs most commonly in the duodenum, followed by the stomach. The bulk of the cases were due to peptic ulcer disease. In these cases, Klebsiella was the most common cause of secondary peritonitis, followed by Escherichia coli and, on rare occasions, proteus and pseudomonas. Cephalosporin antibiotics were most effective against Klebsiella and Escherichia bacteria, with quinolones and macrolides following closely after.

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