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Original Research Article

An Observational Assessment of the Incidence of Intra-Abdominal Sepsis after Emergency Abdominal Surgery

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Abstract

Aim: To investigate the incidence of intra-abdominal sepsis after emergency abdominal surgery.

Materials and Methods: An observational study was conducted in the Department of General Surgery, Jawaharlal Nehru medical college and Hospital, Bhagalpur, Bihar, India for 10 months Patients requiring emergency abdominal surgery for underlying abdominal pathology are included in the study.Patients with sepsis foci other than abdominalcause and Patients with abdominal pathology who do not require emergency surgical intervention were excluded from the study. The detailed information of each patient includingname, age, gender, presenting complaints, duration of complaints, general examination, local examination, systemic examination and other details were noted. Routine investigations like CBC and radiological and histopathological investigations were noted. All thepatients who were included in the study were followed upfor a period of 15 days for the assessment of the intra- abdominal sepsis.

Results: In the present study, we examined 60 cases admitted for emergency abdominal surgeries. The majority of the study subjects were either 20 years old or younger and elderly patients over 60 years, with a mean age of 39.6 ± 21.3 years. The male-to-female ratio was 3.6:1, with 78.3% of the participants being male and 21.7% female. Additionally, 70% of the patients had a history of fever, and 26.67% had a history of trauma that necessitated emergency abdominal surgery. Signs of shock were present in 18.33% of the patients. In most cases (71.7%), the duration of surgery was between 2 to 2.5 hours. The data show that the most common type of sepsis was surgical site infection, with Staphylococcus aureus being the most frequently detected microorganism. The majority of sepsis cases were diagnosed within 4-7 post-operative days. Most common form of intra-abdominal sepsis was surgical site infection (84.09%) followed by peritonitis (9.09%).The other forms of sepsis which had occurred in the patients were drain site infection and anastomosis dehiscence. A statistically significant association was noted for patientswho underwent emergency operative procedure for hollowviscus perforation most commonly developed surgical siteinfection ($p<0.05$) and patients operated for acute intestinalperforation and obstruction ($p<0.05$).

Conclusion: In present study incidence of intra-abdominal sepsis after emergency abdominal surgery was 73.3% of which, the most common was surgical site infection followed byperitonitis. An emergency abdominal surgery poses a greatrisk to developing intra-abdominal sepsis and surgeons should enforce the use of prophylactic antibiotics in the peri-operative period.

Keywords: Intra-Abdominal Sepsis, Emergency Laparotomy, Surgical Site Infection, Peritonitis.

Introduction

Intra-abdominal sepsis is a significant cause of morbidity and mortality following emergency abdominal surgery. It encompasses a spectrum of conditions ranging from localized infections to severe systemic responses that can culminate in septic shock and multi-organ failure. The pathophysiology of intra-abdominal sepsis involves a complex interplay of microbial invasion, immune response, and resultant tissue damage. Emergency abdominal surgeries, often performed under urgent and suboptimal conditions, present a higher risk for postoperative complications, including intra-abdominal sepsis. [1-3] The incidence of intra-abdominal sepsis varies widely, influenced by factors such as the nature of the surgical procedure, the patient's underlying health status, and the presence of comorbidities. [4] Conditions like perforated peptic ulcers, bowel ischemia, and acute

intestinal obstruction are particularly prone to post-surgical infectious complications due to the high bacterial load and potential for extensive tissue injury. Early identification and management of intra-abdominal sepsis are crucial, as delays in diagnosis can significantly worsen the prognosis. Surgical site infections (SSIs) are the most common form of intra-abdominal sepsis, often originating from contamination during surgery or postoperative wound care. These infections can extend to peritonitis, drain site infections, and anastomotic dehiscence, further complicating the patient's recovery. The presence of intra-abdominal sepsis often necessitates additional surgical interventions, prolonged hospital stays, and intensive antibiotic therapy, thereby increasing the healthcare burden. [5,6] Microbial pathogens responsible for intra-abdominal sepsis typically include gram-negative bacilli, such as Escherichia coli and Klebsiella species, as well as gram-positive organisms like Staphylococcus aureus. The polymicrobial nature of these infections complicates treatment regimens and underscores the need for accurate microbial identification and susceptibility testing. [7,8] The management of intra-abdominal sepsis requires a multifaceted approach, combining prompt surgical intervention to remove the source of infection, adequate drainage, and broad-spectrum antibiotic therapy. Advances in surgical techniques and perioperative care have improved outcomes, but intra-abdominal sepsis remains a formidable challenge. Recent studies have emphasized the role of early diagnostic markers and the implementation of evidence-based protocols to reduce the incidence and improve the prognosis of intra-abdominal sepsis following emergency abdominal surgeries . [9,10]

Materials and Methods

An observational study was conducted in the Department of General Surgery, Jawaharlal Nehru medical college and Hospital, Bhagalpur, Bihar, India for 10 months Patients requiring emergency abdominal surgery for underlying abdominal pathology are included in the study. Patients with sepsis foci other than abdominalcause and Patients with abdominal pathology who do not require emergency surgical intervention were excluded from the study. The detailed information of each patient including name, age, gender, presenting complaints, duration of complaints, general examination, local examination, systemic examination and other details were noted. Routine investigations like CBC and radiological and histopathological investigations were noted. All the patients who were included in the study were followed up for a period of 15 days for the assessment of the intra- abdominal sepsis. Patients were assessed for systemic (fever, chills) and local (pain, redness, warmth, swelling, purulent drainage) signs of infections. Examination ofsurgical incision during dressing changes, was done. If SSI was present, the type of SSI, according to the CDC criteria, date of onset, and the micro-organism(s) cultured were reported. The treatment given, re-admission and re- operation were documented. Wounds that were confined to the skin and subcutaneous tissue were classified as superficial. Presence of swelling, tenderness obvious oozing of pus were the main determinants for inclusion into this category. Abscesses were opened in the ward to give way for the pus under pressure, while pus swabs weretaken for microbial sampling. Deep/ organ SSI was determined either through ultrasonography, clinical signs of intraabdominal sepsis or during operation. Specimens were obtained from the infective site by sterile swabs using aseptic technique and immediate transport and processing of the specimen after collection was done. Constant monitoring of the culture systems to detect growth identification of the organism and antibiotic sensitivity testing were done at 16 hours. Reading of the Antibiotic Sensitivity Test was taken 16 hours after putting the antibiotic disc. Dispatch, collection and interpretation of the results were not possible in the immediate period. Theobtained data was entered into Microsoft excel worksheetand was analysed using SPSS. Qualitative data was expressed in terms of percentages and proportions and quantitative data was expressed in terms of mean and standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact testwhere ever necessary. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

Results

In the present study, we examined 60 cases admitted for emergency abdominal surgeries. The majority of the study subjects were either 20 years old or younger and elderly patients over 60 years, with a mean age of 39.6 ± 21.3 years. The male-to-female ratio was 3.6:1, with 78.3% of the participants being male and 21.7% female. Additionally, 70% of the patients had a history of fever, and 26.67% had a history of trauma that necessitated emergency abdominal surgery. Signs of shock were present in 18.33% of the patients. In most cases (71.7%), the duration of surgery was between 2 to 2.5 hours.

Table 1: General Characteristics

General Characteristics	Frequency	Percentage
Age group (in years)		
≤ 20	13	21.6%
21 - 30	10	16.7%
31 - 40	10	16.7%
41 - 50	7	11.7%
51 - 60	7	11.7%
> 60	13	21.6%
Mean age		39.63 ± 21.343
Gender		
Female	13	21.7%
Male	47	78.3%
Other Characteristics		
History of fever	44	70%
History of trauma	16	26.67%
Signs of shock	11	18.33%
Duration of surgery (hours)		
1	3	5%
1.5	10	16.66%
2	25	41.67%
2.5	18	30%
3	4	6.67%

Table 2: Diagnosis at the Time of Admission

Diagnosis	Frequency	Percentage
Acute intestinal perforation	18	30%
Hollow viscus perforation	14	23.33%
Acute intestinal obstruction	11	18.33%
Intussusception	5	8.33%
Peritonitis	4	6.67%
Appendicular perforation	3	5%
Obstructed hernia	2	3.33%
Splenic injury	1	1.67%
Bowel ischemia	1	1.67%
Ruptured pseudocyst	1	1.67%
Total	**60**	**100%**

Table 3: Incidence of Intra-Abdominal Sepsis

Incidence of Intra-Abdominal Sepsis	Frequency	Percentage
Absent	16	26.67%
Present	44	73.33%
Total	**60**	**100.0%**

Table 4: Types of Intra-Abdominal Sepsis

Type of Intra-Abdominal Sepsis	Frequency	Percentage
Surgical site infection	37	84.09%
Peritonitis	4	9.09%
Drain site infection	2	4.55%
Anastomosis dehiscence	1	2.27%
Total	**44**	**100%**

Table 5: Microorganism Detected

Microorganism Detected	Frequency	Percentage
Staphylococcus aureus	19	43.18%
E. coli	16	36.36%
Klebsiella	6	13.64%
Citrobacter	3	6.82%
Total	**44**	**100.0%**

Table 6: Duration from Surgery to Diagnosis of Intra-Abdominal Sepsis

No. of Post-Operative Days	Frequency	Percentage
4-7 days	39	88.64%
8-10 days	5	11.36%
Total	**44**	**100.0%**

These tables summarize the types of intra-abdominal sepsis, the microorganisms detected, and the duration from surgery to the diagnosis of intra-abdominal sepsis. The data show that the most common type of sepsis was surgical site infection, with Staphylococcus aureus being the most frequently detected microorganism. The majority of sepsis cases were diagnosed within 4-7 post-operative days.

Table 7 Intra-abdominal sepsis

	Normal	Intra-abdominal sepsis				P value
		Surgical site infection	Peritonitis	Dehiscence	Drain site infection	
Acute Intestinal	6	9	0	2	1	18
Perforation						
Hollow Viscus	1	13	0	0	0	14
Perforation						
Acute Intestinal	4	7	0	0	0	11
Obstruction						
Intussusception	5	0	0	0	0	5
Peritonitis	0	0	4	0	0	4
Appendicular	0	3	0	0	0	3
Perforation						
Obstructed Hernia	0	2	0	0	0	2
Bowel Ischemia	0	1	0	0	0	1
Splenic Injury	0	1	0	0	0	1
Ruptured Pseudocyst	0	1	0	0	0	1
Total	16	37	4	2	1	60
p Value		0.002	0.0001	0.84	0.98	

Discussion

Emergency surgery is a risk factor for intra-abdominal sepsis as well as other factors such as hemodynamic instability, indication for surgery, degree of wound contamination, and operating time. [8] 73.33% were affected by post-operative intra-abdominal sepsis which is indeed higher in this study than that quoted in surgical literature at12%. [9] Age was found to be a factor for the incidence of intra-abdominal sepsis as quoted by the previous studies that as the age increases the incidence of intra-abdominal sepsis increases and younger age is a phenotypic / physiologic risk factor for adverse outcomes with intra- abdominal infections. [10] In this study surgical site infectionwas most common amongst all age groups and was more commonly seen occurring in patients of 21 to 40 years of age and in the elderly above 60 years. The incidence of peritonitis which was reported post-operatively was 9.09%. Localised peritonitis occurs because peritoneal resistance to infection relies upon localization rather than dispersal of a contaminant. [11] The inhibition of peritoneal fibrinolysis permits stabilization of fibrinous exudates and limits the spread of infection. The momentum 'abdominal policeman' and the intraperitoneal viscera also have aremarkable ability to confine infection as seen for examplein acute appendicitis, perforated duodenal ulcer/ diverticular disease. Thus, localised peritonitis implies either contained or early perforation of a viscus or inflammation of an organ in contact with anterior parietal peritoneum. Conservative treatment with later drainage ofany abscess had been the standard and diffuse peritonitis was usually fatal. [12] Early definitive primary or re-operativesurgery leading to the removal of necrotic tissue, the drainage of abscesses, and the control of peritoneal soilage(source control) may be effective in the intra-abdominallyseptic patient. [13] Ongoing intestinal ischaemia with doubt about intestinal viability is best managed by exteriorizing the bowel ends after resection of the ischaemic bowel anda second-look laparotomy undertaken 24-48 h later. [14] Interestingly, postoperative mortality from post-operative sepsis due to anastomotic leak is higher than any natural condition. The mortality rate of individuals who developed an anastomotic disruption was 39.3%, and anastomotic leak was found to be an independent predictor of mortality. [15] This may be due to the fact that sepsis is the leading cause of death following an anastomotic leak and corroborated by the fact that delayed

diagnosis worsens theprognosis. The acute onset of abdominal pain and generalized peritonitis is a serious manifestation of an anastomotic leak and, these patients may quickly progressto septic shock, requiring intensive care monitoring and resuscitation with fluids and inotropic agents. [16] Patients with diffuse peritonitis from an anastomotic leak or perforated viscus cannot be fully resuscitated until ongoing soiling has been controlled. [17] In such patients resuscitation should be continued intraoperatively (resuscitation surgery) with exteriorization of bowel ends as stomas. [18] Laparostomy as opposed to primary closure of abdominal fascia may be indicated if there is a risk of developing an abdominal compartment syndrome from severe sepsis and septic shock. [19] For haemodynamically stable patients without generalised peritonitis e.g. abscess, a delay of up to 24 h may be appropriate to allow further clinical assessment and image-guided minimally invasive interventional therapy. Among the various pathogens isolated, Staphylococcus aureus was found to be the most common pathogen (43.18%) isolated in our study among the patients with intra-abdominal sepsis (19) followed by E. coli (36.36%). This pattern is consistent with that reported in the literature elsewhere. [20] In 41% of the cultured specimens, a polymicrobial pattern of organism was found. Isolates of two organisms was the norm almostalways involving *S. aureus* species and an enterobacteria. There were no isolates of coagulase-negative *staphylococcus,* which is in contrast to isolates from a large-scale study conducted at Fairview University Medical Centre. [21] The most successful means of preventing intra-abdominal sepsis has been perioperative administration of systemic antimicrobials. [22] Perioperative systemic antimicrobial prophylaxis is indicated for any procedure in which the risk of intra-abdominal sepsis is equal to or greater than that of a clean-contaminated procedure. However, there is evidence that even clean procedures benefit from antimicrobial prophylaxis. Forexample, in a well-designed randomized controlled trial study, antimicrobial prophylaxis significantly reduced infection rates in patients undergoing elective herniorrhaphy. [23] The prevention and progression of sepsisis by early goal directed therapy and source control. Treatment cost of post-operative infections is very high; thus, its prevention could save a lot of resources especially in a developing country like India.

Conclusion

In present study incidence of intra-abdominal sepsis after emergency abdominal surgery was 73.3% of which, the most common was surgical site infection followed by peritonitis. An emergency abdominal surgery poses a great risk to developing intra-abdominal sepsis and surgeons should enforce the use of prophylactic antibiotics in the peri-operative period.

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