



## A Prospective Study on Sepsis after Emergency Abdominal Surgery

Authors

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### Abstract

**Aim:** To study the abdominal sepsis in post-operative period after emergency abdominal surgery

**Materials and Methods:** This is a prospective study on sepsis after emergency abdominal surgery which was conducted during the period from Jan 2015 – June 2016 in the department of Surgery, Vinayaka Missions Kirupananda Variyar Medical College and Hospital Salem. 50 Cases for which emergency abdominal surgery was required for various reasons were included in this study and were assessed for sepsis for the first 15 days after surgery by clinical examination and lab investigations. Patients were treated according to their sepsis foci.

**Results:** 70% of the patients had developed intra-abdominal sepsis after the emergency abdominal surgery. The most common form of intra-abdominal sepsis which had occurred among the patients was surgical site infection followed by drain point site infection.

**Conclusion:** Emergency abdominal surgery has higher risk of developing intra-abdominal sepsis in the post op period. So a better ward, a clean OT with sterile instruments and appropriate use of antibiotics can give a better outcome.

### Introduction

Intra-abdominal sepsis is one of the most challenging situations in surgery and usually presents as peritonitis. Gastrointestinal perforation, with leakage of alimentary contents into the peritoneal cavity, is a common surgical emergency and may have life threatening sequelae. The mortality of perforated viscus increases with delay in diagnosis and management. One of the most common intra-abdominal sepsis after emergency abdominal surgeries is Surgical Site infections (SSIs). They cause pain and inconvenience to patients, result in prolonged hospital stay and may be potentially fatal. Considering the conditions under which

operations are carried out nationwide, the scarcity of experienced, skilled and qualified surgeons, lack of quality medicines sometimes, inadequate resources, high nurse to patient ratio, number of uninformed patients, etc, post-operative infections seem inevitable, but this should be reduced to the barest minimum.

### Objectives

To study about sepsis at post operative period in emergency abdominal surgery cases.

### Materials and Methods

A prospective study was conducted during the period from Jan 2015 – June 2016 in the

department of Surgery, Vinayaka Missions Kirupanada Variyar Medical College and Hospital Salem. 50 cases for which emergency abdominal surgery was needed for various reasons of pain abdomen were included in the study. 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 after the emergency abdominal surgery. Patients were assessed for systemic (fever, chills) and local (pain, redness, warmth, swelling, purulent drainage) signs of infections. The microorganism causing the sepsis was detected by sending the specimen for culture which was obtained under strict aseptic conditions. Patients were treated according to their sepsis foci and no mortality were reported.

**Results**

70% of the patients had developed intra-abdominal sepsis after the emergency abdominal surgery. The most common form of intra-abdominal sepsis which had occurred among the patients was surgical site infection followed by drain point site infection and the other forms of sepsis which had occurred in the patients were mesh infection, peritonitis and anastomosis dehiscence. The commonest microorganism

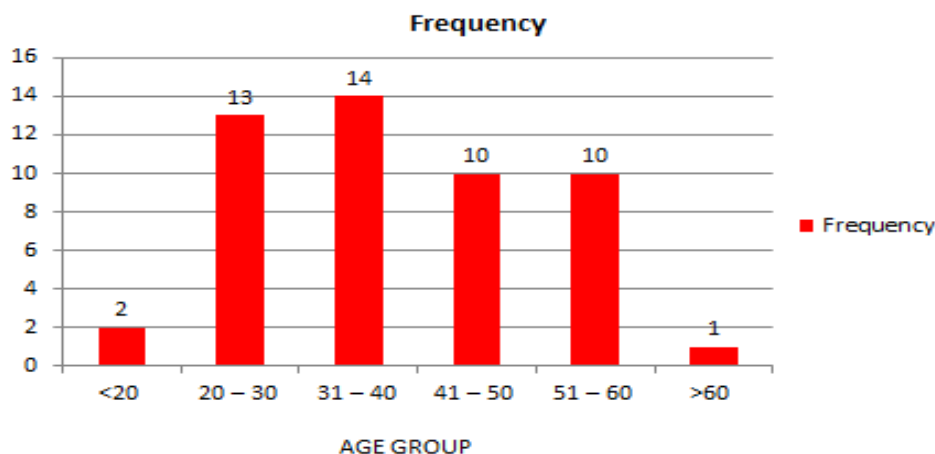
detected from the intra-abdominal sepsis was staphylococcus aureus followed by E.coli and klebsiella. The surgical site infection was more common among the patients who had underwent appendicectomy and the association was found to be statistically significant, similarly peritonitis was more common among patients who had underwent surgery for duodenal perforation and mesh infection was more common among the patients who had hernioplasty. Age and duration of stay in the hospital found to have a statistical significant association in the development of intra-abdominal sepsis.

**Chart 1:** Age wise distribution of the study population

Age group	Frequency	Percentage	Mean age	SD
<20	2	4%	38.1	12.3
20 – 30	13	26%		
31 – 40	14	28%		
41 – 50	10	20%		
51 – 60	10	20%		
>60	1	2%		
Total	50	100%		

Chart 1 shows the age wise distribution of the study population. It is seen from the table that majority of the study subjects were in the age group of between 20 and 40 years and the mean age was 38.1 years.

**Chart 1A:** Age wise distribution of the study population

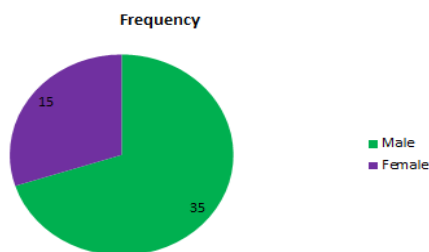


**Chart 2:** Gender wise distribution of the study population

Gender	Frequency	Percentage
Male	35	70%
Female	15	30%
Total	50	100%

Chart 2 shows the gender wise distribution of the study population. It is seen from the table the male: female ratio is 2.3: 1. 70% of them were males and 30% are females.

**Chart 2A:** Gender wise distribution of the study population



**Chart 3:** Distribution of the study population based on the duration of pain

Duration of pain	Frequency	Percentage
1 – 2 days	5	10%
1 – 2 weeks	34	68%
1 – 2 months	11	22%
Total	50	100%

Chart 3 shows the distribution of the study population based on the duration of pain abdomen. It is depicted from the table that majority of the study subjects had the history of pain for 1 – 2 weeks which aggravated gradually and on the day of admission they had a severe pain for which emergency abdominal surgery was done.

**Chart 4:** Distribution of the study population with the history of fever

History of fever	Frequency	Percentage
Present	42	84%
Absent	8	16%
Total	50	100%

Chart 4 shows the distribution of the study subjects based on the history of fever. It is seen

from the table that almost 84% of the patients had history of fever which predicts the underlying infection.

**Chart 5:** Distribution of the study population with the history of trauma

History of trauma	Frequency	Percentage
Present	2	4%
Absent	48	96%
Total	50	100%

Chart 5 shows the distribution of the study subjects with history of trauma. It is seen that only 2 patients out of 50 had history of trauma for which emergency abdominal surgery was performed.

**Chart 6:** Distribution of the study population on the presence of shock based on vital parameters

Shock based on vital parameters	Frequency	Percentage
Present	8	16%
Absent	42	84%
Total	50	100%

Chart 6 shows the distribution of the study population based on the presence of shock which was assessed by the vital parameters at the time of admission. It is depicted from the table that 16% of the patients alone had the signs of shock.

**Chart 7:** Distribution of the study population based on the diagnosis at the time of admission

Diagnosis	Frequency	Percentage
Acute appendicitis	25	50%
Duodenal perforation	8	16%
Jejunal perforation	2	4%
Obstructed inguinal / umbilical hernia	13	26%
Splenic rupture	2	4%
Total	50	100%

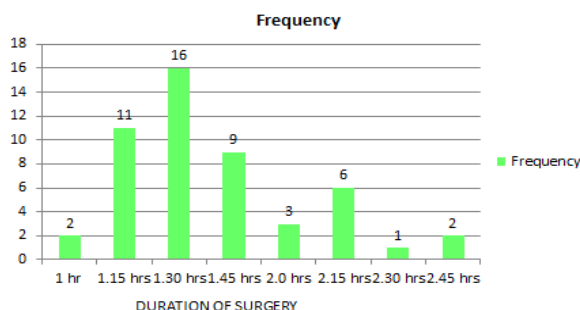
Chart 7 shows the distribution of the study population based on the diagnosis at the time of admission. It is seen from the table that acute appendicitis was the most common diagnosis (50%) made among the patients with acute pain abdomen followed by obstructed inguinal/umbilical hernia and duodenal perforation.

**Chart 8:** Distribution of the study population based on the duration of surgery

Duration of surgery in hrs	Frequency	Percentage
1 hr	2	4%
1.15 hrs	11	22%
1.30 hrs	16	32%
1.45 hrs	9	18%
2.0 hrs	3	6%
2.15 hrs	6	12%
2.30 hrs	1	2%
2.45 hrs	2	4%
Total	50	100%

Chart 8 shows the distribution of the study population based on the duration of abdominal surgery for pain abdomen. It is seen from the table that for majority of the patients the duration of surgery was between 1.00 hr – 1.30 hrs (60%) and the commonest surgery performed on the patients was appendicectomy.

**Chart 8A:** Distribution of the study population based on the duration of surgery



**Chart 9:** Distribution of the study population based on the occurrence of intra-abdominal sepsis after emergency abdominal surgery

Incidence of intra-abdominal sepsis	Frequency	Percentage
Present	35	70%
Absent	15	30%
Total	50	100%

Chart 9 shows the distribution of the study population based on the occurrence of intra-abdominal sepsis after the emergency abdominal surgery. It is seen from the table that 70% of the patients had developed intra-abdominal sepsis after the surgery.

**Chart 10:** Distribution of the study population based on the various types of intra-abdominal sepsis

Types of intra-abdominal sepsis	Frequency (n=35)	Percentage
Surgical site infection	17	48.5%
Drain point site infection	6	17.1%
Mesh infection	5	14.2%
Peritonitis	5	14.2%
Anastomosis dehiscence	2	5.7%
Total	35	100%

Chart 10 shows the distribution of the study population based on the various type of intra-abdominal sepsis which had developed after emergency abdominal surgery. It is depicted from the table that the most common form of intra-abdominal sepsis which had occurred among the patients was surgical site infection followed by drain point site infection and the other forms of sepsis which had occurred in the patients were mesh infection, peritonitis and anastomosis dehiscence.

**Chart 11:** Distribution of the study population based on the type of microorganism detected in the intra-abdominal sepsis

Microorganism detected	Frequency (n=35)	Percentage
Staphylococcus aureus	17	48.5%
E.Coli	11	31.4%
Klebsiella	6	17.1%
Proteus	1	2.8%
Total	35	100%

Chart 11 shows the various type of microorganism which were detected among the patients who had developed intra-abdominal sepsis. It is seen from the table that the commonest microorganism detected was staphylococcus aureus followed by E.coli and klebsiella.

**Chart 12:** Distribution of the study population based on the number of post-operative days for the incidence of intra-abdominal sepsis

No. of post-operative days	Frequency (n=35)	Percentage
5 – 7 days	5	14.2%
8 – 10 days	15	42.8%
11 – 13 days	10	28.5%
14 – 15 days	5	14.2%
Total	35	100%

Chart 12 shows the number of post-operative day after which the intra-abdominal sepsis had developed. It is depicted from the table that for majority of the patients the intra-abdominal sepsis

had developed within 8 – 10 post-operative days and for only 5 patients out of 35 it had occurred in 14- 15 days.

**Chart 13:** Type of emergency operative procedure and the incidence of intra-abdominal sepsis

Diagnosis at the time of admission	Normal	Intra-abdominal sepsis					Total
		Anastomosis dehiscence	Drain site infection	Mesh infection	Peritonitis	Surgical site infection	
Appendicectomy	10	0	0	0	0	15	25
Dudodenal Perforation closure	1	0	2	0	5	0	8
Jejenum Perforation closure	0	0	2	0	0	0	2
Splenic Rupture repair	0	2	0	0	0	1	2
Obstructed inguinal/umbilical hernia – Hernioplasty	4	0	1	5	0	1	13
Total	15	2	6	5	5	17	50
P value	<.0001	<.0001	0.652	<.0001	<.0001	<.0001	

*P value derived by Chi-square test*

Chart 13 shows the type of abdominal surgery and the incidence of intra-abdominal sepsis. It is seen from the table that the surgical site infection was more common among the patients who had underwent appendicectomy and the association was found to be statistically significant, similarly peritonitis was more common among patients who

had underwent surgery for duodenal perforation and mesh infection was more common among the patients who had hernioplasty and the anastomosis dehiscence was more common in patients who underwent splenic rupture repair and all these associations was found to be statistically significant (p<.05).

**Chart 14:** Duration of surgery and the incidence of post-operative sepsis

Post-operative sepsis	Duration of surgery in hrs			Total
	1.0-1.30	1.30 - 2.0	>2	
Normal	12	1	2	15
Anatomosis dehiscence	1	1	0	2
Drain site infection	0	3	3	6
Mesh infection	2	2	1	5
Peritonitis	0	3	2	5
Surgical site infection	14	2	1	17
Total	29	12	9	50
P value	0.432	0.628	0.008	

*P value derived by Chi-square test*

Chart 14 shows the duration of surgery and the incidence of post-operative sepsis. It is inferred from the table that the increase in the duration of

surgery had a statistically significant association with the development of intra-abdominal sepsis (p<.05).

**Chart 15:** Number of post-operative days and the incidence of post-operative sepsis

Post-operative intra-abdominal sepsis	Number of post-operative days				Total
	5 - 7	8 - 10	11 - 13	14 - 15	
Anatomosis dehiscence	0	2	0	0	2
Drain site infection	0	1	3	2	6
Mesh infection	1	2	2	0	5
Peritonitis	1	2	1	1	5
Surgical site infection	3	8	5	1	17
Total	5	15	11	4	35
P value	0.0327	0.0281	0.581	0.349	

*P value derived by Chi-square test*

Chart 15 shows the number of post-operative days after emergency abdominal surgery and the incidence of post-operative sepsis. It is inferred from the table that the surgical site infection type of intra-abdominal sepsis were more common during the post-operative period of 7 – 10 days

and this association was found to be statistically significant ( $p < .05$ ). Whereas the other type of intra-abdominal sepsis did not show significant association with the duration of post-operative period.

**Chart 16:** Gender and post-operative abdominal sepsis among the study subjects

Post-operative intra-abdominal sepsis	Gender		Total
	Female	Male	
Normal	5	10	15
Anatamosis dehiscence	1	1	2
Drain site infection	2	4	6
Mesh infection	0	5	5
Peritonitis	1	4	5
Surgical site infection	6	11	17
Total	15	35	50
P value	0.685	0.480	

*P value derived by Chi-square test*

Chart 16 shows the association between gender and the post-operative abdominal sepsis. It is inferred from the table that there is no statistically

significant association between the gender and the type of post-operative intra-abdominal sepsis among the study subjects ( $p > .05$ ).

**Chart 17: Age and post-operative abdominal sepsis among the study subjects**

Post-operative intra-abdominal sepsis	Age						P value	Total
	<20	20 - 30	31 - 40	41 - 50	51 - 60	>60		
Normal	1	5	3	3	3	0	<.0281	15
Anastomosis dehiscence	0	0	0	1	1	0	<.0156	2
Drain site infection	0	1	1	0	3	1	<.001	6
Mesh infection	0	0	0	2	3	0	<.001	5
Peritonitis	0	1	4	0	0	0	<.0274	5
Surgical site infection	1	6	5	4	1	0	0.0152	17
Total	2	13	13	10	11	1		50

*P value derived by Chi-square test*

Chart 17 shows the association between age and post-operative abdominal sepsis. It is inferred from the table that the post-operative abdominal sepsis like anastomosis dehiscence, drain site infection and mesh infection were more common as the age increases and the surgical site infection was found to be more common in younger age group and this association was found to be statistically significant ( $p < .05$ ). Similarly in younger age group the incidence of intra-abdominal sepsis was found to be less common and the association was found to be statistically significant ( $p < .05$ ).

### Discussions

The overall prevalence of intra-abdominal sepsis after emergency abdominal surgery was found to be 70%. This is indeed a higher rate than that quoted in surgical literature at 12%.<sup>1</sup> Higher infection rate was observed in emergency surgery 27.5%.<sup>3</sup> It has been shown that over 50% of the infections occur within the first week after operation, and about 90% within two weeks.

<sup>4</sup> In 92% of patients scheduled for emergency abdominal surgery the only pre-medications given were atropine and pethidine. The post-operative treatment consisted of penicillin based antibiotic as well as aminoglycoside gentamicin for a five days course. In 38% of these patients a cephalosporin, Cefuroxime was prescribed post-operatively. Adequate patient preparation was

observed in elective cases. Prolonged pre-operative hospital stay is frequently suggested as the one patient characteristic associated with increased SSI risk.<sup>5</sup> However, the length of preoperative stay is likely a surrogate for severity of illness and co-morbid conditions requiring inpatient work-up and/or therapy before the operation.<sup>6</sup> It is hoped that in future the length of pre-operative stay in elective surgery shall be shorter and adequate. Currently patients scheduled for elective hernia surgery are admitted as day cases. The current practice is to admit patients for elective procedures shortly before the surgery. This has been proved to reduce rates of abdominal sepsis.

In the present study the incidence of peritonitis which was reported post-operatively was 15%. Localised peritonitis occurs because peritoneal resistance to infection relies upon localization rather than dispersal of a contaminant.<sup>7,8</sup> The inhibition of peritoneal fibrinolysis permits stabilization of fibrinous exudates and limits the spread of infection. The omentum 'abdominal policeman' and the intraperitoneal viscera also have a remarkable ability to confine infection as seen for example in 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. For instance, a palpable mass in the

right iliac fossa represents either an inflamed mass of adherent omentum, appendix and adjacent viscera, or an abscess. Conservative treatment with later drainage of any abscess had been the standard and diffuse peritonitis was usually fatal.

<sup>9,10</sup> Surgery for appendicitis evolved when the mortality associated with perforated appendicitis was high. Although only a few patients progressed to the potentially lethal complications, early surgery for all patients with suspected appendicitis became the definitive method of preventing severe peritoneal sepsis. The prognosis after appendectomy is excellent.<sup>10</sup> An appendix mass is often detected only after the patient has been anaesthetized and paralysed. Thus, the differentiation of a phlegmonous mass from an abscess is not a practical problem because surgery is the correct management for both. Such a policy renders any debate on interval appendectomy redundant. Operation during the first admission is expeditious and safe, provided steps are taken to minimize postoperative sepsis. The consequences of missing a carcinoma in the elderly patient or other pathology including ileocaecal TB, lymphoma etc are also abolished.<sup>11</sup> Generalised peritonitis will occur when there is failure of localization. Failure of localization may arise for the following reasons: a) a rapid contamination that does not permit localization as in a perforated colon/anastomotic leak, b) persistent or repeated contamination that overwhelms an attempt to overcome it, c) a localized abscess that continues to expand and ruptures into the peritoneal cavity (e.g. appendix, diverticular abscess).<sup>12</sup> The peritoneal cavity becomes acutely inflamed with production of an inflammatory exudate which spreads through the peritoneum leading to intestinal dilatation and paralytic ileus.

Diffuse peritonitis from perforated appendicitis, which has been diagnosed preoperatively, should be dealt with by formal laparotomy, rather than by making a gridiron incision, to allow thorough peritoneal toilet and lavage.<sup>13</sup> Intra-peritoneal abscess should be suspected in any patient who develops signs of sepsis days after a laparotomy.

CT or Ultrasound guided percutaneous drainage of abdominal abscesses via a pigtail catheter has emerged as the procedure of choice in many circumstances as morbidity and mortality is lower than following operative drainage.<sup>14</sup> Laparoscopy if available or laparotomy should be undertaken if doubt remains despite negative radiology.

In our study majority of surgical site infection had occurred in the 8<sup>th</sup> to 10<sup>th</sup> post-operative day and similar type of results were also noted in the studies done by Mastro TD<sup>15</sup> and Lee JT et al.<sup>16</sup> Similarly the 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.

Among the various pathogens staphylococcus was found to be the most common pathogen isolated in our study among the patients with intra-abdominal sepsis. This pattern is consistent with that reported in the literature elsewhere.<sup>17</sup> In 41% of the cultured specimens, a polymicrobial pattern of organism was found. Isolates of two organisms was the norm almost always 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.<sup>2</sup> There is a debate as to whether coagulase-negative *staphylococcus* represent colonization or infection. In the presence of clinical infection it would be appropriate to consider these species as pathogens.

The most successful means of preventing intra-abdominal sepsis has been perioperative administration of systemic antimicrobials.<sup>18</sup> 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. For example, in a well-designed randomized controlled trial study, antimicrobial prophylaxis significantly reduced infection rates in patients undergoing elective herniorrhaphy.



### Conclusion

The causes for the sepsis might include the ward environment, contaminated theatre and patients low immunity status and non-adherence aseptic techniques both in the theatres and the wards. An emergency abdominal surgery poses a great risk to developing intra-abdominal sepsis and as such surgeons should enforce the use of prophylactic antibiotics in the peri-operative period. Prescribing full course of antibiotics in the post-operative period is unjustified.

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