

Original Research Article

An abdominal wound dehiscence of emergency explorative laparotomy and their management at tertiary care centre: an observational study

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ABSTRACT

Background: Wound dehiscence is a very troublesome sequel of impaired wound healing. Despite of medical advances frequency of wound dehiscence in emergency laparotomy remains high due to multiple factors together predisposes. Better understanding of common mechanisms and highly contributing factors will help to keep high risk patients under strict surveillance to reduce the incidence of wound dehiscence.

Methods: The observational study was carried out in 167 patients of above 14 years age at the department of General surgery, SMIMER hospital, Surat between November 2018 to October 2020

Result: 22.15% patients developed wound dehiscence, mean age in dehiscence group was 39.27 ± 9.65 years. Abdominal pain was found in all the patients 100% followed by vomiting 28.74% and fever 13.17%. However, Fever (2.37 ± 1.95 days vs 1.55 ± 1.78 days) and Abdominal distention (1.05 ± 1.06 days vs 0.47 ± 0.87) have statistical significance between Wound Dehiscence and No Wound Dehiscence regarding chief complaints. As a treatment of wound dehiscence, 2 (5.40%) had Re-exploration and 6 (16.21%) had Re-exploration and Tension Suturing in complete wound dehiscence patient group and 29 (78.39%) had Secondary suturing found in partial wound dehiscence. 5.40% of mortality found in Wound Dehiscence group.

Conclusions: Significant risk factors for abdominal wound dehiscence identified in this study are presenting complains like fever and abdominal distension, pre-operative hypoalbuminemia, pre-operative anemia, leucocytosis, renal dysfunction, intra-abdominal sepsis.

Use of subcutaneous negative tube is protective for the condition. Hollow viscus perforation patients showed higher vulnerability for wound dehiscence.

Keywords: Abdominal wound dehiscence, Exploratory laparotomy, Tertiary care hospital

INTRODUCTION

Abdominal wound dehiscence (burst abdomen) defined as postoperative separation of the abdominal musculo-aponeurotic layers.¹ It is considered as one of the most serious and life threatening postoperative complications; comparing the incidence it is as high as 10% in elderly and in adult population is reported to be as 0.3-3.5%.² For surgeons it is of the at most concern because of the need

for intervention, risk of incisional hernia, risk of evisceration, recurrence.¹ post operatively 7 to 10 days is the time where Dehiscence most often observed but may occur even upto 20 days. Newer advancements in the preoperative care of surgical patients, including injectable broader spectrum antibiotics and improved understanding of all the effects of systemic illness on wound healing, the incidence of wound dehiscence has remained constant.³ In about 20-45% of cases, evisceration becomes a morbidity

factor, which associated with higher rates of death during the peri operative period.²

Aim and objectives

Aim of the current study was an abdominal wound dehiscence of emergency explorative laparotomy and their management at tertiary care centre. Objectives were to compare prevalence of abdominal wound dehiscence in the different infective conditions in which emergency explorative laparotomy has been done, To study the effect of different management regime including dressing materials, suture materials and their efficacy related to stay in hospital among the different complication, To study the frequency of re-exploration rate among wound dehiscence patient and To study the frequency of mortality in patient having wound dehiscence after emergency explorative laparotomy.

METHODS

The observational study was carried out in the department of General surgery, SMIMER hospital, Surat between November 2018 to October 2020 after approval from the institutional ethical committee and obtaining written and informed consents from the patients, 167 Patients were included in the study based on the inclusion and the exclusion criteria.

Inclusion criteria

Inclusion criteria were; Patient of age more than 14 years who developed wound dehiscence in <30 days in emergency exploratory laparotomy which done for any infective conditions like ilial perforation, Peptic perforation, Ruptured liver abscess, Ruptured acute appendicitis, Intestinal obstruction due to infective etiology, Hollow viscus perforation due to infective etiology

Exclusion criteria

Exclusion criteria were; age <13 years, pregnant and lactating women, cases which underwent laparotomy for indications other than infective conditions and cases with immune-compromised state.

An elaborative study of these cases with regard to date of admission clinical history regarding the mode of presentation, significant risk factors, investigations, time of surgery and type of surgery and postoperatively, study of diagnosis and day of diagnosis of wound dehiscence is done till the patient is discharged from the hospital. In history, details regarding presenting complaints, duration, associated diseases, significant risk factors like, anemia, malnutrition, obesity, chronic cough, smoking, alcoholism were noted. Details regarding the clinical diagnosis, whether the operation was conducted in emergency and type of incision taken were noted. Intraoperative findings

noted and classification of surgical wounds done accordingly. The type of surgical procedure done was recorded. Statistical data analysed by SPSS version 20 software.

RESULTS

Demographic data

In the present study, among patients who underwent emergency exploratory laparotomy, most of the patients belonged to the young adult age group as compared to the elderly age group in both the groups. Among 167 patients who underwent emergency exploratory laparotomy, 121 were male and 46 were female with a ratio of 2.63:1. Out of 37 wound dehiscence patients 27 (72.97%) were male and 10 (27.02%) were female. The male:female distribution in case of dehiscence is 2.7:1.

Table 1: Age wise distribution.

Age (years)	Wound dehiscence (n=37) frequency (%)	No wound dehiscence (n=130) frequency (%)
18-30	8 (21.62)	32 (24.61)
31-40	13 (35.13)	33 (25.38)
41-50	13 (35.13)	32 (24.61)
51-60	2 (5.4)	25 (19.23)
60-70	1 (2.7)	8 (06.15)
Total	37 (100)	130 (100)
Mean age (years)	39.27±9.65	41.29±12.71

Table 2: Gender wise distribution.

Gender	Wound dehiscence (n=37) frequency (%)	No wound dehiscence (n=130) frequency (%)
Male	27 (72.97)	94 (72.30)
Female	10 (27.02)	36 (27.69)
Total	37 (100)	130 (100)

Prevalence of wound dehiscence

In the present study, among 167 patients who underwent emergency exploratory laparotomy, 37 (22.15%) patients developed wound dehiscence while 130 (77.84%) patients did not. In the present study of the various chief complaints, abdominal pain was found in all the patients 137 (100%) followed by vomiting 48 (28.74%) and fever 22 (13.17%). The associated complains such as abdominal distension, constipation, breathlessness were 22 (13.17%), 12 (7.18%) and 5 (2.99%) respectively. However, Fever (2.37±1.95 days vs. 1.55±1.78 days) and Abdominal distention (1.05±1.06 days vs. 0.47±0.87) have statistical significance between Wound Dehiscence and No wound dehiscence regarding chief complaints (p<0.05).

Table 3: Presenting complains and its duration wise distribution.

Present complains	Wound dehiscence (n=37)		No wound dehiscence (n=130)		P value
	Frequency (%)	Days	Frequency (%)	days	
Abdominal pain	37 (100)	2.97±1.49	130 (100)	3.30±1.38	0.2092
Vomiting	10 (27.02)	0.54±1.11	38 (29.23)	0.71±1.04	0.3887
Fever	6 (16.21)	2.37±1.95	16 (12.30)	1.55±1.78	0.0166
Abdominal distension	7 (18.91)	1.05±1.06	15 (11.53)	0.47±0.87	0.0008
Constipation	0	0	12 (9.23)	4.43±1.67	-
Breathlessness	1 (2.7)	0.08±0.35	4 (3.07)	0.14±0.48	0.4799

Table 4: Biochemical parameters.

Biochemical parameters	Wound Dehiscence (n=37)	No Wound Dehiscence (n=130)	P value
Hemoglobin (gm/dl)	11.27±1.58	12.16±1.29	0.0006
WBC (/mm ³)	11981.08±4659.86	10621.31±2686.03	0.0248
Platelet (/mm ³)	277378.4±95285.35	294761.5±100505	0.3493
S. creatinine (mg/dl)	1.07±0.50	0.85±0.22	0.0001
Blood Urea (mg/dl)	36.16±17.67	32.57±21.06	0.3456
S. Bilirubin (mg/dl)	0.97±0.27	0.92±0.26	0.3076
S. Albumin (mg/dl)	2.86±0.48	3.12±0.50	0.0055

Table 5: Causes of emergency explorative laparotomy.

Explorative Laparotomy	Wound dehiscence (n=37) frequency (%)	No wound dehiscence (n=130) frequency (%)	Total (n=167) frequency (%)	P value
Ileal perforation	13 (35.13)	40 (30.76)	53 (31.74)	0.6149
Peptic perforation	6 (16.21)	29 (22.30)	35 (21.96)	0.4219
Intestinal obstruction	4 (10.8)	24 (18.46)	28 (16.77)	0.2717
Ruptured appendicitis	5 (13.51)	19 (14.61)	24 (14.37)	0.8671
Ruptured liver abscess	8 (21.62)	11 (8.46)	19 (11.38)	0.0261
GI TB	0	3 (2.30)	3 (1.80)	0.3512
Jejunal perforation	0	2 (1.53)	2 (1.20)	0.4478
Caecal perforation	0	1 (0.76)	1 (0.60)	0.5927
Sigmoid perforation	0	1 (0.76)	1 (0.60)	0.5927
Rectal perforation	1 (2.70)	0	1 (0.60)	0.6001
Total	37 (100)	130 (100)	167 (100)	-

Table 6: Intra-operative parameters.

Intra-operative parameters	Wound dehiscence (n=37) frequency (%)	No wound dehiscence (n=130) frequency (%)	P value
Type of surgery			
Clean contaminated	9 (24.32)	41 (31.53)	0.3977
Contaminated	24 (64.86)	89 (68.46)	0.6801
Dirty	4 (10.81)	0	0.0001
Peritonitis			
Present	30 (81.08)	88 (67.69)	0.1145
Absent	7 (18.91)	42 (32.30)	0.1243
Sub-cutaneous negative drain	16 (43.24)	40 (30.76)	0.1561

In the present study, regarding the biochemical parameters, hemoglobin, white blood count, serum creatinine and S. albumin were abnormal in wound dehiscence group as compared to no wound dehiscence group with statistical significance ($p < 0.001$). It was predicted that anemia, renal dysfunction, leukocytosis and

hypoalbuminemia were found more in wound dehiscence who underwent emergency explorative laparotomy as compared to the no wound dehiscence group. In present study, regarding cause of emergency explorative laparotomy, we found ileal perforation (31.74%) most commonly in all operated cases of emergency explorative laparotomy.

Table 7: Antibiotics sensitivity in swab C/S.

Drug (%)	<i>E. coli</i>	<i>Klebsiella</i>	<i>Enterococcus</i>	<i>Staphylococcus</i>	<i>Streptococcus</i>
Imipenem	86.45	94.23	45.34	72.0	-
Amikacin	85.78	65.98	14.5	47.65	34.5
Piperacillin-Tazobactam	72.65	54.56	45.34	53.45	-
Linezolid	65.76	48.67	87.56	94.76	78.56
Clindamycin	58.76	32.78	64.76	58.67	67.43
Ceftazidime	57.44	32.89	56.34	71.0	34.5
Ciprofloxacin	49.56	56.78	23.3	68.56	45.4
Netilmycin	45.98	64.23	-	64.89	-
Cefotaxime	32.79	43.12	-	76.67	-
Cefaperazone-Sulbactam	32.56	23.67	8.45	3.45	5.54
Ceftriaxone	26.75	37.64	-	23.75	-
Gentamycin	8.67	62.65	-	22.32	-
Vancomycin	3.56	5.76	34.45	57.78	87.56

Table 8: Treatment.

Treatment given	Wound dehiscence (n=37) frequency (%)	No wound dehiscence (n=130) frequency (%)
Conservative	0	130 (100)
Re-exploration	2 (5.40)	0
Re-exploration + Tension Suturing	6 (16.21)	0
Secondary suturing	29 (78.39)	0

Table 9: Cause of emergency explorative laparotomy between types of wound dehiscence distribution

Explorative laparotomy	Complete wound dehiscence (n=8) frequency (%)	Partial wound dehiscence (n=29) frequency (%)	P value
Ileal perforation	6 (75)	7 (24.13)	0.0076
Peptic perforation	0	6 (20.68)	0.1598
Intestinal obstruction	1 (12.5)	3 (10.4)	0.8624
Ruptured appendicitis	1 (12.5)	4 (13.79)	0.9244
Ruptured liver abscess	0	8 (27.58)	0.0933
Rectal perforation	0	1 (3.44)	0.5940
Total	8 (100)	29 (100)	

After that we also found peptic perforation (21.96%), intestinal obstruction (16.77%), ruptured appendicitis (14.37%) and ruptured liver abscess (11.38%) in our study. In present study, we found that highest incidence (35.13%) of wound dehiscence was present in ileal perforation patient, which was also most common cause of emergency exploratory laparotomy in our study. So there was no any statistical significance between wound dehiscence and no wound dehiscence regarding cause of emergency exploratory laparotomy.

In the present study, regarding the type of surgery it was found that dirty surgeries have increased risk of wound dehiscence as compared to the clean contaminated surgeries with statistical significance towards no wound Dehiscence group ($p=0.0001$). Meanwhile, Peritonitis was higher in Wound Dehiscence group 30 (81.08%) than no Wound Dehiscence group 88 (67.69%) ($p=0.1145$). Sub-cutaneous negative drain was put in 56 patients, in which

wound dehiscence was presented only in 16 patients (28.57%).

Wound dehiscence type

In present study, 37 patients were developed wound dehiscence. From total wound dehiscence, 8 patients (21.62%) were developed complete wound dehiscence and 29 patients (78.37%) were developed partial wound dehiscence. In swab c/s of all patients, *E. coli* was found most commonly. As per antibiotic drug sensitivity, imipenem and amikacin were found more sensitive against *E. coli* as well as *Klebsiella*. Piperacilin-tazobactam and linezolid were also found sensitive against *E. coli*. Other antibiotic drug sensitivity against other bacteria is given above table. In wound dehiscence group patients had treatment given such as Re-exploration was found in 2 patients (5.40%), Re-exploration and tension Suturing in 6 patients (16.21%), and Secondary suturing in 29 patients

(78.39%) while conservative treatment such as daily dressing was given in no wound dehiscence group.

Type of dressing

Depending on wound in wound dehiscence group patients, there were different types of dressing material used. Out of 37 patients; betadine, eusol & saline dressing was used in 37 patients, 15 patients and 9 patients respectively up to further treatment. In non-wound dehiscence group patients, there was only betadine dressing used.

Demographic between the types of wound dehiscence distribution

Among 37 patients who had Wound Dehiscence, both complete and partial, male preponderance was higher as compared to the females (i.e., 62.5% vs. 79.31%). In comparison between partial and complete wound dehiscence patient group, complete wound dehiscence was found more commonly in ileal perforation patients (75%) with statically significant.

DISCUSSION

Prevalence of wound dehiscence

In this study, 167 patients underwent emergency exploratory laparotomy. Out of these 37 patients developed partial or complete wound dehiscence. This accounts for 22.15% of patients developing wound dehiscence. The wound dehiscence rate reported in international literature varies from 1% to 16%.⁴⁻⁷ Afzal et al reported 8.13%, Talukdar et al reported 12.68%, Hegazy et al reported 14.15%, Hanif et al reported 14.7%, this study, only emergency cases with only due to infective cause were included which may be the reason for higher incidence compared to international studies.⁴⁻⁷ This fact may be attributed to poor patient preparation, complicated inflammatory disease, premorbid factors and contaminated wounds.

Age wise distribution

Mean age in our study is 39 years while in other published literature is between 40-45 years. The contradiction in this study may be because of more number of patients in less than 45 years of age group.

Gender wise distribution

When the sex ratio is considered, 121 of 167 patients were male who underwent emergency exploratory laparotomy and 46 were female. The ratio is found to be 2.63:1. When wound dehiscence proper is considered, the ratio was 2.7:1. There appears to be male predominance on looking at sex ratio. Sex was not a significant risk factor (72.97% were males in Wound Dehiscence compared with 72.30% in No Wound Dehiscence). The other studies demonstrated a higher incidence in the male predominance in each

study.⁸⁻¹¹ Muneiah et al reported 3:1 Nancharaiah et al reported 2.3:1, Ramneesh et al reported 2.84:1 whereas Kapoor et al reported 3.28:1.⁸⁻¹¹

Biochemical parameters wise distribution

Anemia is frequently blamed as an important factor in poor wound healing. But on analyzing the literature, there are conflicting results among many studies. Few studies are in favor of anemia as a causative factor in poor healing. In this current study pre-operative anemia (11.27 ± 1.58 gm%) is found to be significantly associated with contribution to development of wound dehiscence. When looking into the literature, Kapoor et al also noticed in their study a higher incidence (53%) of wound dehiscence in patients having anemia with mean Hb 9.27 ± 1.21 gm%. Ramneesh et al noticed mean Hb 8.44 ± 0.95 gm% in their study in wound dehiscence patients.^{10,11} Hegazy et al in their study found anemia (50%) to have significant association with wound dehiscence like the present study with mean Hb 10.44 ± 1.84 gm%.⁶ Muneiah et al reported 72.2% had hemoglobin level less than 10 g% with mean Hb 9.23 ± 1.14 gm%.⁸ Carson et al stated that anemia a risk factor that is related to increased perioperative stress, blood transfusions, and decreased tissue oxygenation, all of which can affect the immune system and the wound healing process.¹² Hypoalbuminemia is associated with poor tissue healing, decreased collagen synthesis in the surgical wounds or at the anastomosis site. It hampers the immune responses, such as macrophage activation and granuloma formation. Therefore, in hypoalbuminemic patients, wound infection, remote infections such as pneumonia, septicaemia and anastomotic leakage are commonly found. In this study, patients with hypoalbuminemia were found to have 1.9 times higher chance to develop dehiscence when compared to patients with normal albumin level. Like many other studies in literature, this study also obtained a result that hypoalbuminemia has significant effect (p value <0.05) on wound dehiscence.^{8,11} Renal dysfunction and leukocytosis/sepsis are also associated with wound dehiscence. In our study, result of Serum Creatinine and WBC count was statically significant even values were near to normal limit. Same result was also found in different studies like that Talukdar et al study found high renal dysfunction in wound dehiscence group (22.13%) than non-dehiscence group (14.51%) and leukocytosis in wound dehiscence group (77.11%) than non-dehiscence group (14.12%) with statically significant.¹⁶

Intra and post operative outcome wise distribution

Peritonitis was a significant risk factor for burst abdomen. It probably exerts its effect through sepsis-induced anemia and wound infection. In study by Ramneesh et al (70%) patients had perforation of hollow viscus with peritonitis. (20%) patients had intestinal obstruction with no evidence of peritonitis.¹⁰ Kapoor et al study showed that abdominal wound dehiscence is more commonly in patients operated for peritonitis due to hollow viscus perforation (47%).¹¹

Amongst which duodenal perforation accounted for 22%. Other perforations which included gastric perforation, ileal perforation, jejunal perforation accounted for 25%. 20% of the patients had small bowel obstruction. In present study, perforation peritonitis was the most common disease in patients who had dehiscence due to hollow viscus perforation (54.05%). which included gastric perforation, ileal perforation, jejunal perforation. 21.62% of the patients had Ruptured liver abscess and 13.51% of the patients had Ruptured appendicitis and 10.8%. This may be due to 53.3% of emergency laparotomy patients had perforation peritonitis.

Type of surgery

In present study, regarding of type of surgery in wound dehiscence patient group; incidence of clean-contaminated, contaminated and dirty was 24.32%, 64.86% and 10.81% respectively. Which was nearly similar to other study such as in Kapoor et al study, it was 10 %, 63.33% and 26.67% respectively.¹¹

Sub-cutaneous negative drain

In present study, Sub-cutaneous negative drain was put in 56 patients, in which wound dehiscence was presented in 16 patients (28.57%). While in Vishwanath et al study was 3 patients (11.11%) out of 27 patients.¹⁷

Swab C/S

Intra-abdominal sepsis and wound infection hold the highest risk out of all variables for developing wound dehiscence. This result goes in favour of many studies mentioned in literature. In present study swab c/s report of all wound discharge patient, *E. coli* was reported most commonly (48.50%). Other organisms were also found such that Klebsiella (14.97%), Enterococcus (15.56%), Staphylococcus (11.97%) and Streptococcus (8.98%), which is more same as other studies. In Ramneesh et al study, *E. coli* was reported more commonly (40%). Other organisms Klebsiella (22.2%), Pseudomonas (11.1%), staphylococcus (17.8%) and streptococcus (8.9%) were found.¹⁷

Antibiotic sensitivity

In view of antibiotic sensitivity, result of present study is comparable with Hemant et al study. Imipenem and amikacin were more sensitive against *E. coli* an Klebsiella in both study.¹⁵ The most frequent interval at which dehiscence occurred in this study group was the 5th and 7th postoperative days (35% and 37.5% respectively). Whereas it was by 9th day (average) in Kapoor et al, 7th and 8th postoperative days (35% and 37.5% respectively) in Mary et al and 8.6 days (average) in Muneiah et al.^{8,11,13} A study by White et al also showed that disruption most commonly occurs during the second postoperative week.¹⁴

Table 10: Comparative with previous studies.

Drug (%)	In Present Study		Hemant et al ¹⁵	
	<i>E. coli</i>	<i>Klebsiella</i>	<i>E. coli</i>	<i>Klebsiella</i>
Imipenem	86.45	94.23	96.55	100
Amikacin	85.78	65.98	89.65	72.72
Piperacillin-Tazobactam	72.65	54.56	68.96	45.45
Linezolid	65.76	48.67	62.06	66.66
Clindamycin	58.76	32.78	58.62	27.27
Ceftazidime	57.44	32.89	64.48	54.54
Ciprofloxacin	49.56	56.78	55.17	72.72
Netilmycin	45.98	64.23	79.31	72.72
Cefotaxime	32.79	43.12	34.48	36.36
Cefaperazone-Sulbactam	32.56	23.67	51.72	54.54
Ceftriaxone	26.75	37.64	13.79	-
Gentamycin	8.67	62.65	6.89	54.54
Vancomycin	3.56	5.76	-	-

Treatment

In this study, 8 out of 37 (21.62%) patients in which complete wound dehiscence occurred were treated by re-exploration of the wound. Resuturing was done as mass closure with Ethilon loop no 1. 29 patients (78.38%) in which partial wound dehiscence occurred, were initially treated conservatively by daily dressings, underwent delayed resuturing of wound after adequate control of local infection and ingrowth of granulation tissue. In Nancharaiah et al study, 21 out of 30 patients (70%) in

which partial wound dehiscence occurred, were treated as secondary suturing and 9 out of 30 patients (30%) in which complete wound dehiscence occurred, were treated as re-exploration.⁹ In Mary et al study, 13 out of 40 patients (32.5%) were treated by immediate resuturing of the wound.¹³ Resuturing was done as mass closure with polypropylene no.1 with use of retention sutures. 20 patients (50%) initially treated conservatively by daily dressings, underwent delayed resuturing of wound after adequate control of local infection and ingrowth of granulation tissue. 7 out of 40 patients (18.5%) were

treated conservatively as they were not fit for surgery, in the form of daily dressings.

Hospital stay and mortality

In addition, in this study hospital stay was less in non-Wound Dehiscence (14.35 ± 2.81 days vs. $10.87 \pm .89$). Moreover, Hospital stay was also less in Partial Wound Dehiscence (16.5 ± 2.97 days vs. 13.75 ± 2.50 days) and mortality of 2 (5.4%) patients was found in all Wound Dehiscence patients. In Kapoor et al study, the mean hospital stay was 18 days with a range of 5-36 days and 3.33% died in whole study group.¹¹ In Ramneesh et al study, mortality of 2 (4%) patients was found in whole study group.¹⁰

Limitations

Limitations of this study include the fact that it is based on patients recruited from a single setting. our sample size may not be adequate to determine potential confounders.

CONCLUSION

Significant risk factors for abdominal wound dehiscence identified in this study are presenting complains like fever and abdominal distension, pre-operative hypo-albuminemia, pre-operative anemia, leucocytosis, renal dysfunction, intra-abdominal sepsis. Use of subcutaneous negative tube is protective for the condition. Empirical use of most effective Antibiotic and switched over accordingly to swab c/s report if required. Imipenem and amikacin were more sensitive against *E. coli* and *Klebsiella*. Hollow viscus perforation patients showed higher vulnerability for wound dehiscence. From this study, we can also conclude that a number of risk factors for abdominal wound dehiscence can be mitigated during the peri operative period, we conclude that early identification and prompt management of above-mentioned risk factor along with use of proper antibiotics for only emergency abdominal surgery will decreased the incidence and burden on health care system.

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