

## Original Research Article

# Incidence and risk factors influencing morbidity and mortality in cases of burst abdomen after emergency and elective midline laparotomies

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### ABSTRACT

**Background:** Burst abdomen is a serious postoperative complication faced by surgeons and of greatest concern because of risk of evisceration, the need for immediate intervention and the possibility of repeat dehiscence. Wound dehiscence carries with it a substantial morbidity and mortality. In addition, there is an increase in the cost, increased hospital stays, nursing and manpower cost in managing its complications.

**Methods:** In this study a total 202 patients enrolled who underwent emergency and elective midline laparotomies. Patients clinically presenting as gaping of abdominal wound were included in study. Diagnosis was established by clinical examination. In all cases gentle probing of the wound with gloved finger done to confirm defect.

**Results:** In this study incidence of burst abdomen was seen in 80 patients (39.6%) and was common in patients who underwent emergency surgeries. Patients who had stoma construction had maximum number of burst abdomen. 150 (74%) cases underwent emergency laparotomies in which 64 (42%) cases developed burst abdomen. In 60 cases closure done with re-suturing of fascia and remaining cases by skin closure only due to sepsis, poor general condition of patients. Mortality was seen in (22.5%) patients due to postoperative complications

**Conclusions:** Burst abdomen is more common in emergency surgeries than elective surgeries. Wound infection and stoma construction increase the rate of burst abdomen. Mid-mid line incisions have increased incidence of wound dehiscence. Mortality is high despite early treatment due to complications.

**Keywords:** Burst abdomen, Evisceration, Midline laparotomy, Wound dehiscence, Wound disruption

### INTRODUCTION

Wound dehiscence/burst abdomen is a serious postoperative complication and of greatest concern because of risk of evisceration, the need for immediate intervention, and the possibility of repeat dehiscence, surgical wound infection and incisional hernia formation.<sup>1</sup> Despite progress made in perioperative and postoperative care over the past few years, wound dehiscence after abdominal surgery continues to be a challenging complication, which considerably prolongs hospital treatment and is associated with mortality rates

of 10% to 44%.<sup>2,3</sup> Wound dehiscence carries with it a substantial morbidity and mortality.

In addition, there is an increase in the cost of care both in terms of increased hospital stay, nursing and manpower cost in managing the burst and its complications. Despite increased knowledge about wound healing, advances in preoperative care and suture materials, wound dehiscence continues to be a significant problem which prolongs hospital stay and is associated with significant morbidity and mortality.

The incidence of wound dehiscence/burst abdomen varies from one center to another worldwide. While it is recorded to be 1-3 % in most centers, some center's in India recorded incidence of burst abdomen as high as 10-30%.<sup>4</sup> Burst abdomen is associated with a mortality rate as high as upto 45%. Numerous studies have been conducted evaluating a bewildering variety of closure techniques and suture materials. The need for this study is to highlight the risk factors for wound dehiscence, the incidence in our hospital and to predict the outcome of the management of abdominal wound dehiscence.

In the present study a total of 80 cases clinically presenting as gaping of abdominal wound with or without evisceration of bowel included. Suturing of the abdominal fascia was done in majority of our cases and in few cases only skin was approximated due to infection and inability to approximate the fascia. Many risk factors were incriminated in the causation of burst abdomen, including malnutrition, anemia, hypo-proteinaemia, pre and post-operative prolonged steroid therapy, peritonitis, malignancy, jaundice, uraemia, post-operative abdominal distension and cough.

Apart from this surgeon factors like placement of incision, improper suture technique, aseptic precaution also play a role.<sup>5</sup> The incidence of burst abdomen has not changed much despite better understanding of wound healing, improved postoperative care, surgical techniques, suture materials and better antibiotics. Burst abdomen carries with it significant morbidity and mortality despite early recognition and management. This may be due to underlying disease itself or complications which develop in the postoperative period.

## METHODS

This study was conducted in the Department of General surgery, Osmania general hospital, Hyderabad, a tertiary care teaching hospital. A total of 202 patients were enrolled for the study who underwent emergency and elective midline laparotomies from 2015 march to 2017 September.

### *Inclusion and exclusion criteria*

Both male and female patients undergoing emergency and elective midline laparotomy in the age group of 21-80 years in both male and females. Patients clinically presenting with abdominal wound dehiscence (burst abdomen) with or without evisceration

Patients who had incisions other than midline laparotomies were excluded.

Out of 202 laparotomies 150 patients underwent emergency laparotomies and 52 were elective laparotomies. 80 patients presenting as gaping of abdominal wound with or without evisceration were included in the present study (Figure 1, 2 and 3).



**Figure 1: A case of partial wound dehiscence following laparotomy for blunt abdominal trauma.**



**Figure 2: A case of complete wound disruption with evisceration due to anastomotic leak following ileoileal anastomosis.**



**Figure 3: A case of complete wound disruption due to severe postoperative bowel edema.**

After the confirmation of diagnosis all cases were studied carefully with regard to age, risk factors, method of primary closure of fascia and postoperative complications were analyzed. In all cases initial laparotomy was done by mid line incision and was closed by continuous suturing using non-absorbable, no. 1 polypropylene suture which included peritoneum and fascia in a single bite. Skin closure was not done in few cases due to heavy

contamination of wound which was closed later by delayed primary suture.



**Figure 4: A case of complete wound disruption following laparotomy for peritonitis, closed by fascial closure.**

Closure of burst abdomen in 60 (75%) cases was achieved by re-suturing of the fascia with number one polypropylene suture (prolene) under general anaesthesia with proper relaxation, broken and cut suture material was removed, abdominal cavity was explored as far as possible to assess the underlying pathology (Figure 4). Fascia was closed either by continuous or interrupted manner depending on the case. Mesh was not used in any case due to fear of mesh infection. In remaining 20 (25%) patients fascia could not be approximated due to severe bowel edema, retraction and destruction of fascia and continuing wound infection.



**Figure 5: A case of complete fascial disruption which was managed by skin closure only.**

These cases were managed by closure of only skin with interrupted sutures to prevent drying and damage to the underlying structures (figure 5). In both the group of cases abdominal wall support was given by abdominal binder postoperatively.

**RESULTS**

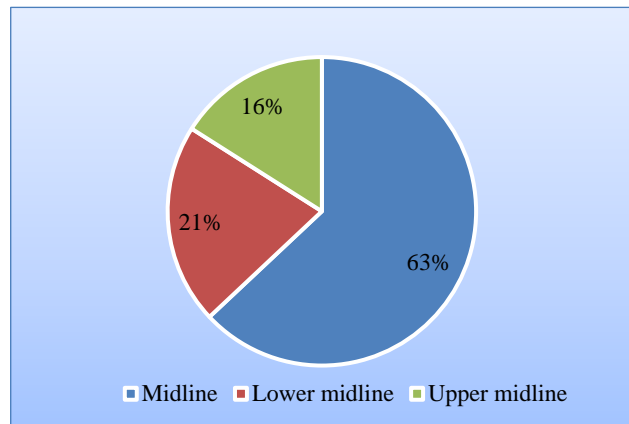
In this study out of 80 cases 56 (70%) were male patients and 24(30%) were female patients. 26 (32.5%) patients

with burst abdomen were in the age group of 51-60 years. Average age group was 45-60 years.

**Table 1: Number and percentage of patients who developed burst abdomen after emergency and elective surgery.**

Type of surgery	No. of cases	Percentage
Elective surgery	16	20
Emergency surgery	64	80

In the present study 13 (16%) cases with burst abdomen had upper mid line incision (above umbilicus incision), 17 (21%) cases had lower midline incisions (below umbilicus), and 50(63%) cases had mid midline incisions (extending above and below umbilicus to a variable length).



**Figure 6: Frequency of burst abdomen in relation to type of incisions.**

In our study 63% of patients had mid midline incisions, 21% patients had lower midline incisions and 16% patients had upper midline incisions (Figure 6). Number of mid midline incisions were more because of a greater number of exploratory laparotomies in our study group.

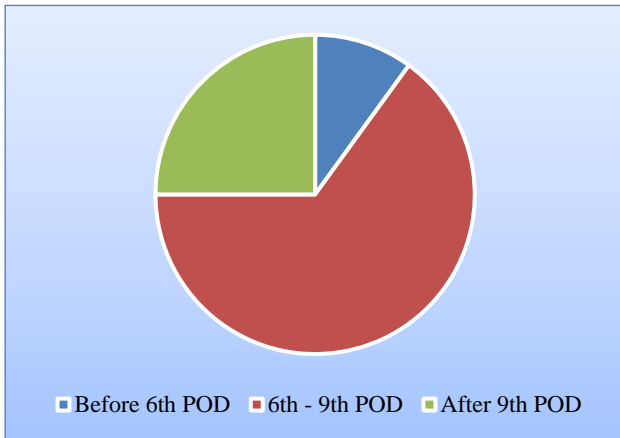
**Table 2: Various abdominal procedures in which burst abdomen was seen.**

Procedure	No. of cases
Perforation closure	27
Resection and anastomosis	18
Stoma preparation	23
Others	12

Among 80 cases, 27(33.75%) patients underwent surgery for intestinal perforation closure, resection and anastomosis in 18 (22.5%) cases, ileostomy and colostomy done for 23 cases (28.75%), other procedures done in 12 (15%) cases (Table 2).

Clinically burst abdomen was noticed, in 52 (65%) cases between 6<sup>th</sup> to 9<sup>th</sup> post-operative day, in 8 (10%) patients

before 6<sup>th</sup> POD (postoperative day) and in 20 (25%) cases after 9<sup>th</sup> POD (Figure 7).



**Figure 7: Relation between post-operative day and burst abdomen**

In this study, re-suturing of abdominal wall fascia could be achieved in 60 patients and in remaining 20 cases fascia could not be closed due to wide gaping and retraction of fascia and severe bowel edema.

**Table 3: Mortality and survivals.**

Total no. of patients	Survivals	Mortality
80	62 (77.5%)	18 (22.5%)

In the postoperative period, 18 (22.5%) patients died of postoperative complications like septicaemia, organ failure and respiratory complications (Table 3).

## DISCUSSION

Acute wound failure has been discussed under various names i.e. wound dehiscence, burst abdomen, wound disruption etc. and is a serious postoperative complication following a laparotomy and incidence varies from 0.2 to 5% in elective surgeries and upto 45% in emergency surgeries and the mortality and morbidity rates upto 30%.<sup>6,7</sup> Abdominal wound dehiscence remains one of the major cause of morbidity and mortality following vany laparotomy whether elective or emergency laparotomies. Factors affecting the abdominal wall wound healing are numerous and relates to the charecteristics of the patient, its comorbidities, type of pathology and method of surgical management. No single cause being responsible: rather it is a multi-factorial problem. Basic events seen in wound dehiscence are decreased wound strength and increased disruptive forces, and infection.

According to a study by Mathur et al, abdominal wound dehiscence is more common in developing world which ranged upto 30% in laparotomies performed for various conditions, than in Western population where it ranged from 0.4 to 3.5%.<sup>8</sup> This may be attributable to poor

nutritional status of the patients, delayed presentation to the hospitals, frequent development of postoperative wound infections and higher load of emergency surgeries. In the present study out of 202 patients who underwent emergency and elective laparotomies 80 patients (39%) developed burst abdomen in the postoperative period. This was due to delayed referral to our hospital as most of the cases were referred from remote hospitals where they were poorly managed and were having complications like septicaemia, severe electrolyte imbalance, anemia, severe malnutrition with hypoalbuminaemia at the time of presentation. Another reason is postoperative development of severe bowel edema resulting in increased intra-abdominal pressure coupled with increased incidence of postoperative respiratory complications and septicaemia and multi-organ failure.

In a study conducted by Spiliotis J et al, in 3500 patients who had laparotomies showed that abdominal wound disruption was more common in male patients than in female patients.<sup>9</sup> In a study conducted by Gabrielle et al, incidence of burst was seen in 75% male and 25% female patients respectively.<sup>5</sup> In the present study, 56 (70%) were male patients and 24 (30%) were female patients which is similar to above studies. This male predominance is probably due to the greater number of male cases in our study group, higher incidence of gastrointestinal perforation in male patients and increased incidence of postoperative gastrointestinal leaks and development of more respiratory complications due to smoking habits. It was also observed that most of the male patients were operated for malignancy and intestinal obstruction in emergency setting, which were also risk factors for wound disruption, as shown in a study conducted by Jaiswal NK et al where he found that wound disruption in cases of malignancy and intestinal obstruction was observed in 14.63% and 18.29% cases respectively.<sup>10</sup>

Risk of wound dehiscence also increases with advanced age. In a study conducted by Spiliotis et al and Gabrielle et al, advanced age is one the important independent risk factor for wound dehiscence due to poor immune status and decreased collagen synthesis.<sup>9,5</sup> In the present study also burst abdomen was more commonly seen in the age group of 51-60 years.

In a study conducted by Qaiyoume A et al, abdominal wound dehiscence was more common in emergency laparotomies compared to elective cases.<sup>4</sup> In a study conducted by Soni P et al burst abdomen was more common in emergency cases than in elective cases.<sup>11</sup> In the present study emergency laparotomies were performed in cases of advanced cases of peritonitis, obstruction and other delayed cases, as well as delayed referral from other hospitals. At the time of surgery most of our patients had complications like septicaemia, respiratory problems, malnutrition. Another reason may be due to inadequate pre-operative preparation and

optimization of patients in emergency setting due to lack of time for optimization and poor general condition of patients when compared to elective cases. Second factor responsible for this high incidence of wound dehiscence especially in emergency cases may be due to more number of cases with intestinal perforations with severe peritonitis which itself are significant risk factor for wound infection and dehiscence. Third factor, would have played a role in wound dehiscence, is lack of experience on part of surgeon as most of our emergency laparotomies were performed by surgical residents. This may have resulted in Technical errors such as taking inadequate bites of fascia, closure under tension. The lower incidence of burst abdomen in the elective cases compared to the emergency cases can be explained by fact that, in elective cases we had time to correct risk factors before surgery and all cases were done by senior faculty. Septic complications also very less in elective surgeries due to adequate preparation.

In a study conducted by Britt M et al, the procedure of closing the midline laparotomy was done by using a "small steps" technique of continuous suturing with a slowly absorbable suture material reduces the rate of fascial dehiscence.<sup>12</sup> In another study conducted by Srivastava A et al burst abdomen was mostly seen in the continuous suturing technique when compared to interrupted closure method.<sup>13</sup> In a continuous suturing cutting out of even a single bite of tissue or breakage of suture leads to opening of the entire wound. This may be the probable explanation for the high incidence of burst in patients where abdomen was closed by continuous technique. In our study all emergency and elective laparotomies were closed by continuous suturing by using non-absorbable polypropylene sutures of no. 1 size, taking peritoneum and fascia in mass closure. Skin was left open in heavily contaminated cases and closed in cases where contamination was minimal. We observed that wound dehiscence was more common in cases where skin was closed primarily, as wound infection occurred more frequently in those cases. In cases where skin wound was not closed primarily incidence of wound infection was very less and had decreased incidence of dehiscence. Skin wound was closed by delayed primary closure after 3-5 days in those cases.

In a study done by Jyrki T et al, they observed no significant differences between the different techniques of abdominal fascia closure, either by continuous and interrupted method, and closing the peritoneum separately did not influence the rate of wound dehiscence.<sup>14</sup> The most important cause of wound dehiscence was cutting through the tissue, which was a frequent finding. It was also recommended that the midline incision should be closed after laparotomy with a continuous mass closure technique.<sup>15</sup> Randomized clinical trials have shown that the closure of an abdominal incision with a monofilament continuous absorbable suture is faster and stronger than closure with a multifilament interrupted absorbable suture and can be

done without an increased risk of wound dehiscence or incisional hernia.<sup>16</sup>

In a study conducted by Soni P et al anemia, hypoproteinemia, obesity, coughing, malnutrition, diabetes were the risk factors for the burst abdomen.<sup>11</sup> In a study conducted by Gabrielle et al, the risk factors for abdominal wound dehiscence were anemia, chronic pulmonary disease, ascites, jaundice, emergency surgery, coughing and wound infection.<sup>5</sup> Protein calorie malnutrition is widely prevalent in the Indian population. The problem gets compounded with the onset of diseases like tuberculosis, and cancer. In the present study malnutrition accounted for 44% of the cases as evidenced by anaemia, decreased albumin levels, decreased body mass index.

In a Study by Grantcharov et al, showed that the incidence of abdominal wound dehiscence and burst abdomen were more common in patients with vertical incisions than in those with transverse incisions.<sup>17</sup> In another study conducted by Bhat JG et al, burst abdomen was seen more in midline incisions as it was the commonly used incision.<sup>18</sup> In another study conducted by Amer H et al, incidence of burst abdomen was more common in vertical (midline) incisions.<sup>19</sup> In another study by Kapoor KK et al, incidence of burst abdomen was more common in the patients who underwent laparotomy with mid midline incisions.<sup>20</sup> Similarly, in the present study all patients had midline vertical incisions of which mid midline incisions (incisions extending below and above umbilicus to a variable extent) had maximum number of burst abdomen. This may be due to higher number of mid midline incisions taken during emergency surgery as most of our cases were exploratory laparotomies because the exact diagnosis was not known preoperatively and because the patients needed thorough irrigation of peritoneal cavity and pelvic cavity for advanced peritonitis. We were of the opinion that depending on intra-operative findings the mid midline incision could be extended either upwards or downwards. It was also observed that during re exploration for burst abdomen closure, necrosis of linea alba was seen in majority of cases which may be due to strangulation of fascia by tight sutures.

In a study conducted by Spiliotis et al, 9<sup>th</sup> post op day was mean for wound dehiscence with a range from 6<sup>th</sup> to 15<sup>th</sup> day.<sup>9</sup> In a study by Soni P et al, burst abdomen was seen commonly on 6<sup>th</sup> to 8<sup>th</sup> postoperative day.<sup>11</sup> In another a study conducted by Bhat JG et al, burst abdomen was mostly seen on the 7<sup>th</sup> postoperative day.<sup>18</sup> Similarly in the present study burst abdomen was most commonly observed between 6<sup>th</sup> to 9<sup>th</sup> post op day with a mean of 7<sup>th</sup> postoperative day.

In a study by Theodoros E et al, found that wound infection has been associated with a ten-fold increase in the possibility of wound dehiscence.<sup>21</sup> The commonest microorganism found in cultures was *Staphylococcus*

*aureus*, followed by *Escherichia coli* and *Pseudomonas*. The use of steroids, anaemia, and diabetes mellitus were found not to be significant factors in his study. In the present study wound infection was present in 77% cases with burst abdomen. It was recognized by pus discharge from the wound, pain, induration and constitutional symptoms. Pus culture revealed gram negative enteric organisms, increased number of wound infections were due to a greater number of septic cases in our study group and stoma construction. In majority of stoma patients wound culture revealed enteric pathogens which may have come from adjacent stoma site. In one case burst abdomen was observed on 12<sup>th</sup> post-operative day with healing of wound with no discharge or pain. This patient had strained at stools and had complete dehiscence and evisceration.

In a study by Jaiswal NK et al, burst abdomen was more common in intestinal perforation followed by intestinal obstruction.<sup>10</sup> Another study conducted by Kapoor KK et al, abdominal wound dehiscence was more common in intestinal perforation closure followed by resection and anastomosis.<sup>20</sup> In the present study also burst abdomen was seen in 27 (33.755%) patients who underwent surgery for intestinal perforation closure.

In a study conducted by Srivastava A et al mortality in burst abdomen was reported in upto 18% of cases and in a similar study by Meena K et al, upto 15%.<sup>13,6</sup> Mortality rate associated with wound dehiscence mentioned in literature is 15-24%. Fischer et al reported it to be 36%.<sup>22</sup> In our study 18 patients with wound dehiscence (22.5%) died due to postoperative complications like septicaemia, respiratory complications and multi organ failure. This is slightly higher than the above studies as most of our patient population included emergency surgeries with delayed presentation and associated comorbid conditions.

## CONCLUSION

From the above study we conclude that burst abdomen was more common in emergency laparotomies than elective cases, probably because of more incidence of wound infections, anastomotic leaks and the presence of comorbid conditions such as hypoproteinaemia, diabetes and old age. Wound dehiscence commonly occurs on average 7<sup>th</sup>-9<sup>th</sup> postoperative day and can also occur in apparently normally healed wounds. Suture technique of fascial closure either by continuous or interrupted method has no role to play in wound dehiscence. Careful technique in suturing the abdominal wall is more important than the use of any particular method excessive tension in suture can lead to breakage and necrosis of fascia between bites and can lead to burst abdomen. Mortality following burst remains high as most of the patients develop systemic complications such as septicaemia or respiratory infections and multi organ failure.

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## REFERENCES

1. Kulaylat MN, Dayton MT. Surgical complications. Sabiston text book of surgery. 19th edition. Saunders; 2012:283-284.
2. Keill RH, Keitzer WF, Nichols WK. Abdominal wound dehiscence. Ann Surg. 1973;106:573-7.
3. Bettman RB, Kobak MW. Relative frequency of evisceration after laparotomy in recent years. JAMA. 1960;172:1764.
4. Amini AQ, Khan NA, Ahmad J, Memon AS. Management of abdominal wound dehiscence: still a challenge. Pak J Surg. 2013;29(2):84-7.
5. Gabriëlle H, van Ramshorst, Nieuwenhuizen J, Hop WCJ, Arends P, Boom J, et al. Abdominal wound dehiscence in adults: development and validation of a risk model. World J Surg. 2010;34:20-7.
6. Meena K, Ali S, Chawla A, Aggarwal L, Suhani S, Kumar S, et al. A prospective study of factors influencing wound dehiscence after midline laparotomy. Surg Sci. 2013;4(8):354-8.
7. Carlson MA. Acute wound failure. Surg Clin North Am. 1997;77:607-36.
8. Mathur SK. Burst abdomen: A preventable complication, monolayer closure of the abdominal incision with monofilament nylon. J Postgrad Med. 1983;29.
9. Spiliotis J, Konstantino S, Tsiveriotis, Datsis AD, Archodoula, Georgios, et al. Wound dehiscence. World J Emerg Surg. 2009;4:12.
10. Jaiswal NK, Shekhar S. Study of burst abdomen; its causes and management. Int Surg J. 2018;5:1035-40.
11. Soni P, Haripriya VB, Haripriya A, Dutt V. Burst Abdomen; a postoperative morbidity. Int J Sci Study. 2015;3(6):175-8.
12. Tolstrup MB, Watt SK. Reduced rate of dehiscence after implementation of a standardized fascial closure technique in patients undergoing emergency laparotomy. Ann Surg. 2017;265(4):821-6.
13. Srivastava A, Roy S, Sahey KB. Prevention of burst abdominal wound by a new technique; a randomized trial comparing continuous versus interrupted X-suture. Indian J Surg. 2004;66(1).
14. Makela JT, Kiviniemi H, Juvonen T, Laitinen S, Finland O. Factors influencing wound dehiscence after midline laparotomy. Ame J Surg. 1995;170(4):387-90.
15. Wadstrom J, Gerdin B. Closure of abdominal wall: how and why? Clinical review. Acta Chir SC. 1990;156:75-32.
16. Sahlin S, Ahlberg J, Granström L, Lungström K-G. Monofilament versus multifilament absorbable sutures for abdominal closure. Br J Surg. 1993;80:322-4.

17. Grantcharov TP, Rosenberg J. Vertical compared with transverse incision in abdominal surgery. *Eur J Surg.* 2001;167(4):260-7.
18. Bhat JG, Desai AD, Dave JP. A prospective study of 50 cases of abdominal wound dehiscence – etiology and its management. *IJSR.* 2017;2275-8.
19. Amer H, Mokhtar SM, Harb SE. Burst abdomen: should we change the concept, preliminary study. *Egyptian J Surg.* 2017;36:199-207.
20. Kapoor KK, Hassan MMN. A clinical study of abdominal wound dehiscence with emphasis on surgical management in Bangalore medical college and research institute. *Int Surg J.* 2017;4(1):134-40.
21. Pavlidis TE, Galatianos IN, Papaziogas BT, Lazaridis CN, Atmatzidis KS, Makris JG, et al. Complete dehiscence of the abdominal wound and incriminating factors. *Eur J Surg.* 2001;167:351-4.
22. Fischer L. Burst abdomen: clinical features and factors influencing mortality. *Dan Med Bull.* 1992;39:183-7.

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