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# Burst Abdomen – A Grave Postoperative Complication

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## Abstract

**Introduction:** Burst abdomen represents one of the most frustrating and difficult post-operative complications experienced by surgeons who do a significant volume of surgery. Burst abdomen occurs because of various preoperative, operative and postoperative predisposing factors which can be prevented to some extent by having knowledge regarding them. Burst abdomen can be treated successfully to decrease morbidity and mortality due to it. **Aims of Study:** The purpose of this study was to review the patients who underwent laparotomy for various intraabdominal conditions and developed burst abdomen, to study various preoperative, operative and postoperative predisposing factors associated with development of burst abdomen, to know the rates of incidence, morbidity and mortality due to burst abdomen and also to study the management of burst abdomen. **Patients and Method:** Sixty cases of burst abdomen were studied who were admitted either as emergencies or planned indoor patients and underwent laparotomy for various intraabdominal pathologies. Various factors which have influence on the occurrence of burst abdomen were carefully studied. Management and outcome of the patients were also studied. **Result:** Burst abdomen occurs in the middle age group with a male to female ratio of 4.5:1 and with an incidence rate of 5.6%. High incidence of burst abdomen was noticed in patients with gastrointestinal perforation and in patients who had emergency laparotomy with vertical midline incision. Preoperative predisposing factors like cough, anemia, hypoproteinemia and postoperative factors like cough, wound infection, uremia, abdominal distention, bowel leakage, vomiting, electrolyte imbalance and ascites have significant influence on the incidence of burst abdomen. It can be treated either conservatively or by suturing with a mortality rate of 10%. **Conclusion:** Burst abdomen is a serious sequel of impaired wound healing. Many factors predispose to this grave complication. Knowledge of the more common mechanisms and how to avoid or overcome these hazards will help to reduce the incidence of this dangerous complication.

## INTRODUCTION

Post-operative surgical complications represent one of the most frustrating and difficult occurrences experienced by surgeons who do a significant volume of surgery. Burst abdomen is a very serious postoperative complication which is associated with high morbidity and mortality rates. It increases the cost of treatment and is associated with lost work productivity, disruption of normal family life and unanticipated stress to employers and society in general.

Burst abdomen can occur for a variety of reasons. A surgeon can perform a technically perfect operation in a patient who is severely compromised by the disease process and still have a complication. Similarly, surgical technical errors may account for this operative complication.

Various preoperative factors which are predisposing to this unpleasant, grave and tragic postoperative complication are brought into light. Also, operative and postoperative periods are studied in detail to prevent this complication.

The department of Surgery at Sir Sayajirao General Hospital and Medical College, Baroda, India, is also facing the problem of burst abdomen frequently. This has led us to study the frequency, risk factors, management and complications of burst abdomen. A descriptive study at the Department of Surgery, at Sir Sayajirao General Hospital and Medical College, Baroda, was carried out in patients undergoing abdominal surgery. A total of 60 cases were studied who had abdominal surgery performed during the period of May 2004 to November 2006.

## PATIENTS AND METHOD

A study of 60 cases of burst abdomen was carried out at the Department of General Surgery at Sir Sayajirao General Hospital and Medical College, Baroda, from May 2004 to November 2006.

All the patients were admitted in Sir Sayajirao General Hospital as indoor patients. They were either admitted as emergency patients or as routine patients. The biodata of the

patients in the form of name, age, sex and address was noted. Furthermore the date of admission, date of operation and date of discharge/death were noted, too.

In each patient, a detailed history of the disease was taken. Abdominal pain, vomiting, distention, constipation and cough were the common complaints. Detailed history taking ensued thereafter in the form of elaboration of origin, duration and progress of the illness, past history and treatment.

A complete physical examination was performed and the vital data and other physical findings were noted. Also, a thorough systemic examination of the abdomen and of the respiratory, cardiovascular and central nervous systems was performed.

The patients were diagnosed on the basis of clinical symptoms, physical examination, haematological investigations like haemoglobin, serum protein, blood sugar, serum creatinine, blood urea and radiological investigations like x-ray of chest and abdomen (standing) and ultrasonography which are available in our hospital.

In each patient, operative procedure and intraoperative findings were noted. Postoperative complications like cough, wound infection, abdominal distention, vomiting, bowel leakage, uremia or electrolyte imbalance were also noted.

Post-burst-abdomen treatment, total hospital stay, mortality and cause of death were also noted.

In our study, out of 60 patients, operative treatment in form of resuturing was done in 16 patients. This was done under general anesthesia and a good muscle relaxant was given. Wound and protruding viscera were cleaned with saline and surrounding skin was cleaned with Savlon. Protruding viscera were kept back into the abdominal cavity, margins of the wound were refreshed and stitches were taken with Ethilon No. 1. Tension sutures were taken. After resuturing, patients were given abdominal binders. Suture removal was done delayed.

Twenty-four patients were treated conservatively; daily dressing of the wound and protruding viscera was done, saline and long stripes of gauze were applied and abdominal binders were given. Day by day healthy granulation tissue developed and the wounds healed by secondary intention.

In 20 patients, conservative treatment was given and when the healthy granulation tissue developed, secondary suturing

of the wound with delayed suture removal was done.

In patients who were severely anemic blood transfusions were given. In severely morbid patients and those who had severe hypoproteinemia, parenteral amino acids and lipids were given, especially in patients of bowel leakages. Other forms of treatments like multivitamins, antibiotics etc. were given accordingly.

**OBSERVATION AND ANALYSIS**

**INCIDENCE**

A total of 1070 abdominal operations were performed. Out of them, 60 patients developed wound dehiscence, giving an incidence of 5.6%.

**AGE**

The youngest patient was 12 days old and the oldest patient was 70 years old. The highest incidence of burst abdomen in the present study was between 41 and 50 years of age, the average age being approximately 42 years. The patients in this study were in the range of 42 ± 17.9 (ISD) years.

**SEX**

In our study, 81.67% of the patients were male and the remaining 18.33% females. The male : female ratio was approximately 4.5 : 1.

**PRIMARY DISEASE**

**Figure 1**

DIAGNOSIS	NO. OF PATIENTS	PERCENTAGE
Gastrointestinal perforation	32	53.3
Acute appendicitis	03	5
Peritonitis	09	15
Subacute intestinal obstruction	02	3.3
Acute intestinal obstruction	07	11.5
Blunt abdominal injury	01	1.7
Penetrating abdominal injury	01	1.7
Carcinoma of stomach	01	1.7
Carcinoma of recto-sigmoid junction	01	1.7
Obstructed inguinal hernia	01	1.7
Rectovesical fistula	01	1.7
Hirschsprung's disease	01	1.7

Out of 60 patients of burst abdomen, the majority had gastro-intestinal perforation (53.3%).

**PREOPERATIVE PREDISPOSING CAUSES**

**Figure 2**

CAUSES	NO. OF CASES
Cough	19
Anemia	34
Hypoproteinemia	28
Steroid	-

The study showed that the majority of patients had anemia as preoperative predisposing factors. Many patients had more than one predisposing factor.

**TYPE OF INCISION**

**Figure 3**

INCISION	NO. OF PATIENTS	PERCENTAGE
Midline	57	95
Right para-median	01	1.6
Lower transverse	02	3.4

In this study, 95 % of burst abdomen occurred after vertical midline incision. In the remaining patients, right para-median (1.6%) and lower transverse (3.4 %) incisions had been used.

**PLANNED OR EMERGENCY SURGERY**

**Figure 4**

OPERATION	NO. OF PATIENTS	PERCENTAGE
Planned	04	6.67
Emergency	56	93.33

The incidence of burst abdomen was much higher in patients operated as emergency surgery as compare to planned surgery.

**TIME OF DISRUPTION**

The majority of burst abdomen occurred between 7<sup>th</sup> and 10<sup>th</sup> post-operative day, with the highest incidence on the 7<sup>th</sup> post-operative day.

**POST-OPERATIVE PREDISPOSING CAUSES**

**Figure 5**

CAUSE	NO. OF CASES
Cough	27
Wound infection	44
Uremia	09
Abdominal distention	21
Bowel leakage	06
Vomiting	06
Electrolyte imbalance	05
Ascites	01

Many post-operative predisposing factors are responsible for burst abdomen. In this study, wound infection, cough and abdominal distention were leading factors in the majority of the cases. It is noted that most of the patients had more than one predisposing factor responsible for the development of burst abdomen.

**DIAGNOSIS**

In our study, 35 patients out of 60 had serosanguinous discharge from the wound on the 6<sup>th</sup> or 7<sup>th</sup> post-operative day. Fifteen patients out 60 had a swelling over the local wound site which was soft and tympanic. Six patients experienced themselves that something had given way at the local wound site and 4 patients had vomiting.

**PARTIAL OR COMPLETE BURST**

In our study, 36 patients out of 60 (60%) had complete burst involving the whole length of the wound while 24 patients out of 60 (40%) had partial burst.

**MANAGEMENT**

In our study, 24 out of 60 patients were given conservative treatment in form of daily dressing while in 16 out of 60 patients, immediate resuturing of the wound was done and 20 patients were initially given conservative treatment and when granulation tissue developed, delayed suturing was done.

No patient had re-burst or other complications after treatment.

**TOTAL HOSPITAL STAY**

Total hospital stay of the patients increases because of burst abdomen. In our study, out of 60 patients, 22 had a total hospital stay between 31 and 40 days.

The mean duration of total hospital stay was 37.6 ± 16.8

(ISD) days.

### MORTALITY

Out of 60 patients, death occurred in 6 patients, giving a mortality rate of 10 %. Out of these 6 patients, 3 died because of peritonitis, 2 because of renal failure and 1 because of bronchopneumonia.

### DISCUSSION

#### INCIDENCE

The overall incidence of burst abdomen in this series is 5.6% which is a little higher as compared to various studies mentioned in western literature. The incidence rate in Wolff's study (1950) was 2.6% (1), Mann (1962) found 2.72% (2), Efron (1965) 2.2% (3), Lehman et al. (1968) 2.5% (4).

#### AGE

There appears to be an increase in the frequency of burst abdomen with advancing age. The highest incidence in the present series was between 41 and 50 years of age, the average being 42 years. According to Maingot (5) the average age is 45 years. Wolff (1) found that age is of some importance etiologically for disruption which was four times more common in patients above the age of 45 years than in the younger group.

The present series shows that the highest incidence of burst abdomen is between 41 and 50 years of age. This may be due to the following items:

- Those factors which pre-dispose to burst abdomen are frequently found in this age group like chronic cough due to various causes, chronic constipation and dysuria.
- Presence of anemia, hypoproteinaemia, and multiple vitamin deficiency in this age group.
- Post-operative complications like straining or cough, repeated vomiting and infection in respiratory system are more common in this age group.

The frequency rises with cancer age, i.e. 45 to 60 years. This observation coincides with Hampton's (6) observation in cancer cases and he considers that there is a correlation but not a cause-and-effect relationship.

### SEX

The study shows that males are more commonly affected than females, i.e. in 81.67% and 18.33%, respectively. In 1934, Colp (7) found a frequency of burst abdomen of 1.12% in males and of 0.75% in females. Hampton (6) observed that males are three times more often affected than females (1963). Mayo and Lee (1951) also observed the same pattern of frequency of burst abdomen, i.e. males were affected more often than females. (8)

The high incidence of burst abdomen in males may be due to excessive use of alcohol and smoking in males as compared to females which leads to chronic respiratory troubles giving rise to cough and diminished functional efficiency of the liver and other vital organs.

### PRIMARY DISEASE

It is noted that the frequency of burst abdomen is related to the underlying pathological condition for which the patient was operated. In the present series, the majority of the patients were diagnosed as having a gastrointestinal perforation (53.3%).

Maingot (5) mentioned that patients with pathologies of the biliary system or stomach are prone to developing a burst abdomen.

A higher incidence is found with operations of the gastrointestinal tract. The underlying explanation can be as follows:

- Stomach disease presents with pain, anorexia, nausea and vomiting. This dyspepsia leads to multiple deficiencies of vitamins, proteins and other substances, i.e. to marked anemia. It is observed that haemoglobin and serum protein deficiency lead to defective and delayed healing.
- Carcinoma leads to cachexia and marked anemia due to anorexia, haemorrhage and bone marrow depression.
- In biliary tract disease, the main symptoms are anorexia, dyspepsia and vomiting. Liver functions are depressed and so serum protein estimation is always low. Furthermore, a longer vertical extension of the incision is required in these patients to exclude other lesions and for wide exposure to avoid accidental complications.

### **PRE-OPERATIVE PREDISPOSING CAUSES**

In the present study it was noticed that pre-operative predisposing factors like anemia, hypoproteinemia and cough were associated with the incidence of burst abdomen. In many patients, there was more than one factor leading to the occurrence of burst abdomen.

Joergenson and Smith (6) and Wolff (1) noticed in their study a higher incidence of burst abdomen in patients having anemia, hypoproteinemia and vitamin deficiency.

In our study, out of 60, 34 patients had haemoglobin levels less than 10g/dl. According to Maingot (3), at least 70% of the normal haemoglobin level is required for elective safe surgery. Haemoglobin contributes the oxygen to the regenerating granulation tissue and lower haemoglobin levels affect the wound healing.

Hypoproteinemia is one of the most important factors which delayed healing. In our study; 28 patients out of 60 had a serum protein level below 6 g/dl. For tissue repair, large amounts of amino acids are required. Amino acids help in the formation of RNA and DNA. Deficiency of these leads to poor cellular tissue, so wound strength is lost and burst abdomen is predisposed.

The importance of pre-operative cough was not emphasized previously until Hampton (6) pointed out a higher frequency of burst abdomen in patients having pre-operative cough. In our study, 19 patients had pre-operative cough. Cough leads to increased intra-abdominal pressure and prolonged cough because of tuberculosis affects the wound healing and predisposes to burst abdomen.

### **TYPE OF INCISION**

In our study, 95% of burst abdomen occurred in vertical midline incisions, with the remaining patients having right para-median (1.6%) or lower transverse incisions (3.4%).

Anatomical factors which might make a vertical upper abdominal wound more likely to burst are as follows:

- Interference with blood supply as it runs transversely. The rectus abdominal muscle has a segmental blood and nerve supply.
- If incision is little more laterally, the medial part of the rectus abdominal muscle gets denervated and ultimately atrophied. This creates a weak spot in the wall and burst abdomen. This is the reason why one should not go beyond the midline.

- The rectus sheath is disturbed in vertical direction. The fibers of the sheath run transversely, so by vertical incision all of them are cut. Similarly, the anterior sheath is detached from the tendinous insertion.
- With upper abdominal incision, pain prevents chest movements thus favoring more respiratory complications and cough. Cough will increase intraabdominal pressure more in the upper part leading to tension strain in the fresh wound.
- Elastic fibers of the skin also run transversely, so they are cut by vertical incision. The strength of the wound is decreased. But as the linea alba is a weaker structure below the umbilicus, burst abdomen is more common with lower incision.

The following are the important factors enhancing the chances of burst abdomen:

- Inadequate muscle relaxation during abdominal wound closure.
- Undue tension over the stitches and increased intra-abdominal pressure due to peritoneal fluid; drainage relieves the tension.
- Forgetting to suture the peritoneal layer with the transversalis fascia as it has the tendency to get retracted.
- The majority of the abdominal surgeries are done with vertical midline incision in our hospital.

### **PLANNED OR EMERGENCY SURGERY**

It is noted that if the operation is done in emergency, the frequency of burst abdomen is higher. As shown in the table above, 6.67% of burst abdomens occurred after planned operations and 93.33% after emergency surgery.

The explanation is as follows.

In planned operations, pre-operative physiotherapy and all blood investigations are carried out. If any infection is present, it is treated pre-operatively.

Lack of bowel preparation in emergency operations as compared to planned operations, especially for surgery of the gastrointestinal tract.

In emergencies, the underlying pathological lesion also plays an important role. In most of the emergency operations, infected lesions lead to various forms of peritonitis or wound infection. Both of them prevent wound healing.

Lack of local aseptic preparation of parts which infect the wound and increase the frequency of burst abdomen.

### **TIME OF DISRUPTION**

According to Bailey (10), the maximum incidence is found on the 8<sup>th</sup> post-operative day. In the present study, the maximum number of cases occurred from the 6<sup>th</sup> to 10<sup>th</sup> post-operative day, with the maximum on the 7<sup>th</sup> postoperative day.

The explanation for the maximum incidence of burst abdomen on the 7<sup>th</sup> post-operative day can be:

- Usually we remove stitches on the 7th or 8th post operative day. Until that time the occurrence often remains undetected. On removing the stitches, the burst becomes evident.
- We continue antibiotics for one week and on stopping them there might be relapse of infection and burst abdomen may thus occur later on.
- The patients with major abdominal surgery are in the bed having intravenous infusions up to 4 or 5 days. Then they begin to move and try to pass stools. All this increases intra-abdominal pressure. The holding-together capacity also becomes less and less until, after 10 days, stitches hardly have value.

### **POST-OPERATIVE PREDISPOSING CAUSES**

Many post-operative factors lead to high incidence of burst abdomen. In the present study, out of 60 patients, 44 had wound infections, 27 had post-operative cough and 21 had abdominal distention. More than one factor was found in most of the patients.

Wound infection is a major post-operative cause for wound disruption. It leads to slough out of the stitches and separates the rectus sheath. Wound infection is more common in emergency operations and patients presenting with peritonitis.

Post-operative cough also leads to high frequency of burst abdomen. It usually occurs because of respiratory tract infection, possibly post-anesthetic, leading to increased intra-abdominal pressure. Thus, tension over the freshly

sutured wound can cause burst. In the same way, post-operative abdominal distention also increases tension on the freshly stitched wound leading to burst.

Vomiting after abdominal surgery leads to vigorous tension on the suture line and breaks up the stitches leading to burst abdomen. Uremia is also a factor which disturbs wound healing and leads to burst abdomen. Bowel leakage leads to peritonitis and infects the wound.

In the post-operative period, electrolyte imbalance and ascites also have an effect on wound healing and tension on wound contributes to the occurrence of burst abdomen.

### **DIAGNOSIS**

In our study, 35 out of 60 patients had serosanguinous discharge from the wound. This is almost pathognomonic of dehiscence. It is an indicator of sheath gap and of burst abdomen.

Fifteen patients had a swelling over the wound site which was a soft and tympanitic boggy swelling that distends the wound. It indicates that a knuckle of gut has burst through all the layers of the abdominal wall and lies under the skin incision.

Six patients experienced themselves that there is something giving way at the wound site. This occurs after excessive strain like excessive cough or vomiting. Four patients had unexplained vomiting which led to the diagnosis of burst abdomen.

Maingot (3) observed in his study that most of the patients had serosanguinous discharge from the wound. Some also had swelling at the wound site and some had unexplained vomiting.

### **COMPLETE OR PARTIAL BURST**

Thirty-six patients out of 60 had complete burst abdomen in our study, i.e. the whole wound was burst. This usually occurred in patients having severe peritonitis in which the whole sheath was sloughed out and in patients who had severe strain.

Twenty-four patients had partial burst abdomen. Those having wound infections that affect a small area had partial burst abdomen.

Wolff (1) observed in his study that the majority of patients had complete burst abdomen.

### **MANAGEMENT**

In our study, 24 out of 60 patients were treated conservatively. Those patients who were not fit for surgery were treated conservatively in form of daily dressings. Day by day healthy granulation tissue developed and the wound healed by secondary intention.

Sixteen out of 60 patients were treated by immediate resuturing of the wound. Resuturing was done as mass closure with Ethilon no. 1.

Twenty patients out of 60 were treated initially with conservative treatment and then, when granulation tissue developed, delayed suturing was performed.

Maingot (3) described that patients treated with conservative treatment had prolonged hospitalization and more morbidity as compared to patients treated by immediate resuturing.

### **TOTAL HOSPITAL STAY**

Because of burst abdomen, the total duration of hospital stay increases and patients are discharged after prolonged hospitalization. Patients treated with conservative treatment or with delayed suturing had prolonged hospitalization.

### **MORTALITY**

Mortality following burst abdomen varies considerably in different reported studies. It is reported as low as 11% by Wolff (4) and as high as 40% by Hartzell and Winfield (11). Hampton (6) observed the mortality rate to be 23% in 1963. In the present study the mortality rate is 10%.

The mortality rate is steadily decreasing as years are passing on. In the last 30 years the rate has decreased to half of the previous one. The reasons for such a decrease can be as follows:

- Early recognition of the burst abdomen and skillful choosing of those cases that should be treated by immediate resuturing, those that should be treated by delayed resuturing and those in whom non-operative treatment should be employed.
- Pre-operative preparation of the patient by correcting hypoproteinemia, anemia, vitamins deficiency and also physiotherapy.
- Advance in general anesthesia where post-anesthetic complications are lowered and at the time of operation good muscle relaxation is permitted to the operating surgeon.

- Easily availability of blood and its free use during and after operation.
- Rapid advance and introduction of better broad-spectrum antibiotics in general use
- whereby controlling the severe infections.
- Early ambulance of the operative patient and employment of post-operative physiotherapy.
- Better understanding of surgical physiology and pathology of burst abdomen.

Still this mortality can be greatly reduced by thorough examination of patients and their selection for operation, pre-operative preparation, skillful and aseptic surgery, better post-operative care and, lastly, by keeping this complication in mind.

### **CONCLUSION**

Burst abdomen is a serious sequel of impaired wound healing. It occurs most commonly in the 41-50 year age group, predominately in males and with vertical midline abdominal incisions. Many factors can pre-dispose to this grave complication. Knowledge of the more common mechanisms and how to avoid or overcome these hazards should help to reduce the incidence of this dangerous complication. The more common factors contributing to wound disruption can be summarized as follows:

- Presence of pre-operative anemia, hypoproteinemia, and cough favors high incidence of burst abdomen.
- During operation, disregard of blood supply to incision site, improper haemostasis, poor suturing technique and bad anesthesia predispose to burst abdomen.
- Post-operatively, unusual abdominal wall strain from persistent cough, vomiting, abdominal distention, uncontrollable wound infection, presence of ascites, bowel leakage and lack of physiotherapy attributes to the development of burst abdomen.

Proper and early diagnosis of burst abdomen and proper treatment decrease morbidity and mortality.

If the above predisposing factors are well understood before

doing any abdominal surgery, the present incidence and mortality rates can be reduced further.

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