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Frequency and Risk Factors for Wound Dehiscence in Midline Laprotomies.

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I. Introduction

Abdominal wound dehiscence (burst abdomen, fascial dehiscence) is a severe postoperative complication, with mortality rates reported as high as 45%.[1,2] The incidence, as described in the literature, ranges from 0.5% to 3.6%.[3,4] Dehiscence of the wound after abdominal surgery is a serious complication that continues to plague the surgeon and threaten the patient. Burst abdomen is an inescapable responsibility of the surgeon who made the wound. Dehiscence is the disruption or breakdown of a wound.[5,6]*It may range in magnitude from a failure of the deeper portions of the abdominal incision to unite, unrecognized in the postoperative course but resulting in a dramatic* burst abdomen" or evisceration in which dehiscence of the wound occurs suddenly and is accompanied by protrusion of abdominal contents, usually bowel, through the disrupted wound. Sometimes it may present as incisional hernia later. Significant wound dehiscence occurs in approximately 1% of all laparotomies.[6] The incidence of wound disruption is correspondingly greater in a series of patients with various predisposing factors.Disruption can take place at any time in the postoperative period but most often occurs between the fifth and twelfth postoperative days. In patients with healing problems the disruption may occur much later. It may occur shortly after the skin sutures have been removed. In about half the cases disruption will be heralded by the appearance of a serosanguinous discharge on the dressing.[5,6] If this occurs before the seventh day, it may be considered pathognomonic of dehiscence.Usually such a complication implies inadequate preoperative treatment, improper postoperative management, wound infection and poor surgical technique.Frequently, burst abdomen occurs because of the nature of the disease. Urgent need for operative intervention may preclude satisfactory preoperative preparation of the patient. Drainage of abscess or perforation of viscus may result in continuous and unavoidable contamination of wound.Burst abdomen is defined as separation of all layers of incision. It may be partial or complete.Partial when one or more layers have separated but either the skin or the peritoneum is intact.Complete when all layers of the abdominal wall have opened apart and this may or may not be associated with evisceration of viscus.When an abdominal wound gapes open or disrupts[7], a condition called burst abdomen / wound dehiscence /wound disruption / post operartive eventration occurs. It is a morbid complication of surgery. Usually encountered above the age of 60 years and common in males, can be partial or complete. Prognosis of this condition becomes worse with delayed diagnosis and increasing age. In a few patients the disruption is violent and sudden, with protrusion of the intestines through the wound onto the surface of the abdomen.[6] Appropriate treatment at the bedside includes protecting the intestines with sterile towels, promptly administering a narcotic, intravenously if possible, and immediately taking the patient to the operating room. This type of disruption has long been associated with a substantial mortality rate, but most often, death is a result not of the disruption but of the underlying conditions that caused it. The most frequent complications after disruption and resuture of a wound are a generalized peritonitis or a pulmonary complication.These should be anticipated and appropriate preventive measures taken. Some patients experience and describe a tearing sensation preceding the disruption. When such an event is described by an extremely obese patient and there is no surface evidence of the disruption, an oblique soft tissue roentgenogram of the abdominal wall may help to establish the diagnosis by showing gas in intestinal loops trapped in the deep subcutaneous tissues.[8]

Risk factors for burst abdomen

Elderly >60 years, diabetes with fasting blood sugars more than 140 mg%, malnutrition, obesity with BMI > 30, anemia of <10 gm % hemoglobin levels, uremia of blood urea levels >50 mg%, jaundice with serum bilirubin levels above 4 mg%, hpoprotenemia of serum protein less than 5gm%, intra abdominal malignancy, intrabdominal sepsis with pus in peritoneal cavity.

Risk factor score for burst abdomen
A large study among group analysis of burst abdomen has resulted in identification of several risk factors responsible for this complication.

These factors with scores are
CVA or stroke - 4
History of COPD - 4
Current pneumonia - 4
Emergency procedure - 6
Operative tikme of > 2.5 hours – 2
Final year post graduate as surgeon - 3
Clean wound - 3
Superficial wound infection – 5
Deep wound infection – 17
Failure to wean - 6
One or more complications - 7
Return to operating room - 11
Based on the above risk factors, the risk categories for wound dehiscence are,
Low risk if score is <3
Medium risk if scores are of 4-10
High risk if scores are between 11-14
Very high risk if scores are >14

Clinical features of burst abdomen are[9]
It occurs suddenly with patient complaining of something giving way usually between 6^{th} to 10^{th} post operative days. There will be soakage of abdominal dressing with serosanguinous fluid, and patient going into shock and dehydration, muscle sutures give way and intra abdominal contents are exposed. Thus the study aimed to find out and record the etiological factors for Burst abdomen.

II. Materials and Methods

This was a prospective study done on fifty patients who developed burst abdomen following various types of laparotomies in Dept of Surgery in SKMCH Muzaffarpur from Oct 2019 to Dec 2020.

An informed consent was taken from the patients and their relatives to use the information for publication purpose..

The inclusion criteria used were, patients above 18 years of age of either sex, who gave consent for investigations and treatment.

All the patients with burst abdomen during the study period were included, and those who lost with follow up and who died were excluded from the study.

A comprehensive history and thorough physical examination with any other relevant history were recorded.

The etiological factors studied were age of the patient, sex, indication for surgery, whether emergency or elective, nature of surgery, type of incision, duration of surgery, day of burst abdomen, anemia, hypoprotenemia of serum proteins less than 5 gm% estimated with biuret test, post operative wound infection confirmed with culture sensitivity of wound swabs, respiratory infections in post operative period assessed by history of either cough or dyspnoea or both and auscultation of lungs for crepitations and conformed with chest x- ray for pneumonitis or pleural effusion.

Examination of abdomen for distention, serosanguinous discharge, wound dehiscence, wound infection and evisceration was noted. All the patients with burst abdomen were subjected to investigations for hemoglobin, serum proteins, blood sugar, urea and creatinine levels in blood, wound swab for culture and sensitivity, also x-ray of chest. A detailed proforma of the etiological factors, risk factors, examination findings and investigations was prepared and the results compared with other studies.

III. Results

Of the 50 patients studied, wound dehiscence with maximum number seen in 50-60 years age group (28.%) (table-1). Males were the most commonly susceptible 39 out of 50 (78.%) (figure-1). Patients in whom emergency laprotomy was done were at high risk of burst abdomen. In this study, 36 of the 50 patients (72.%) who had wound dehiscence were operated for surgical emergency (figure-2). Maximum patients (26 out of 50) with burst abdomen was operated for peritonitis in emergency. These patients constituted to more than half (52%) of the cases of wound dehiscence. Thesecond most common indication of surgery leading to wound

dehiscence later were failure to progress with normal delivery leading to emergency cesarian section (8 of the50). Emergency laparotomies for intestinal obstruction also lead to burst abdomen in 6 of the 50 patients. The other causes for wound dehiscence in this study are surgery for malignancy in 5 patients, pancreatic surgery in 3, surgery for divarication of recti and rectal prolapse in 1 patient (table-2) lIn this study in 52% of patients that is in 26 out of 50) where surgeries was prolonged for more than 2 hours developed wound dehiscence.. Post operative days between 6 to 10 are the phase in which wound dehiscence was most commonly seen (39 out of 50) 78%.In 12% patients (6 out of 50) wound dehiscence occurred before 6th day and 10% wound dehiscence on 10th postoperative day .Anemia is one of the major risk factor for wound dehiscence in this study. Patients with hemoglobin levels less than 10 mg% constituted to 63% (31 of 50) of burst abdomen (table-3) (figure-3). There were 36 patients of the total 50(72 %) burst abdomen patients who had hypoprotenemia of serum proteins less than 5 gm%. 72% of the patients (36 of the 50) had associated wound infection with wound dehiscence.

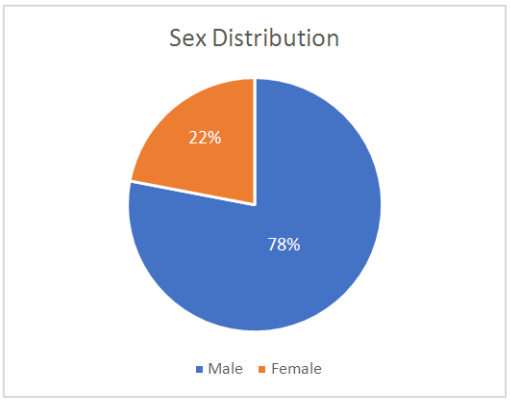

Figure 1 – Sex distribution

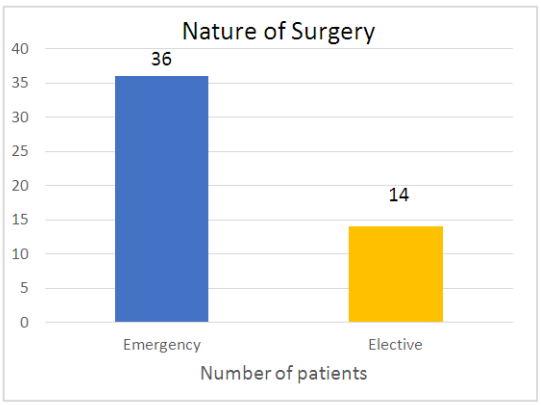

Figure 2 - Nature of Surgery

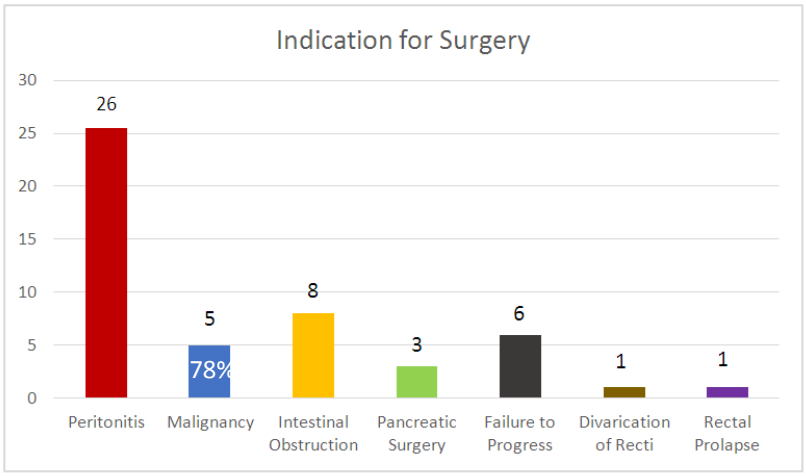

Figure 3 – Indication of Surgery

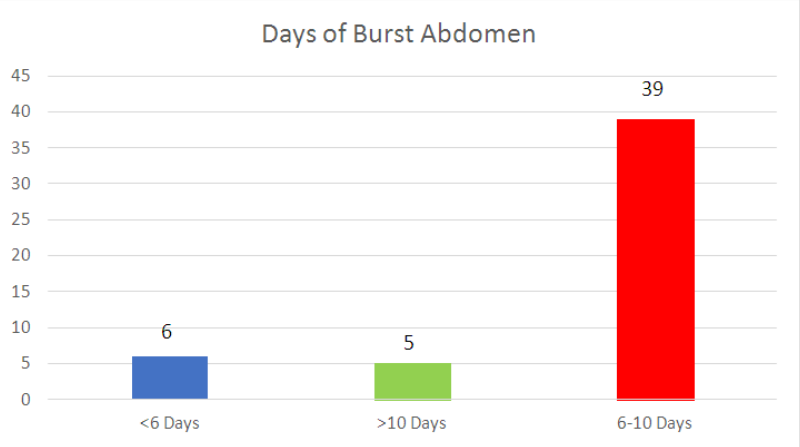

Figure 4 – Days of Burst Abdomen

Age Group	Number of patients	Percentage
0-10	0	0
11-20	0	0
21-30	6	12
31-40	10	20
41-50	10	20
51-60	14	28
>60	10	20

Table -1: Age Distribution

Serum Protein level	Number of Patients	Percentage
<5gm%	36	72
>5gm%	14	28

Table 2 : Distribution of Hypoproteinaemia

Wound Infection	Number of Patients	Percentage
Present	36	72
Absent	14	28

Table 3 : Post operative Wound Infection

IV. Discussion

This study reviewed 50 patients who had laparotomy wound dehiscence over a period of 15 months, from Oct 2019 to Dec 2020. In this study, the average age of patients with delayed wound healing was found to be 46.25 years. Incidence of hollow viscus perforation and bowel obstruction was common in this age group. Old age is another independent risk factor for abdominal wound dehiscence. Age has also been reported as a risk factor in other studies.10 The explanation for this might lie in deterioration of the tissue repair mechanism in the elderly. As age increases, collagen undergoes quantitative and qualitative changes. Also there is alteration in the early inflammatory period of wound infection and decrease in hypoxic response of the wound with advancing age. Advanced age is also associated with nutritional disorders, pulmonary complications, and comorbid conditions like diabetes, malignancy, and other affiliations of age. In this study there was a higher male population with a ratio of 3.54:1. Predilection of male gender to burst abdomen can be explained by abdominal breathing, greater physical activity, less elasticity of abdominal wall and can be attributed to the higher incidence of peptic ulcer perforation and intestinal obstruction in male gender and also for the reasons of consumption of alcohol and smoking which lead to respiratory infections. Peritonitis due to hollow viscus perforation and also drainage of an abscess may result in continuous and unavoidable contamination of wound that interfere with the wound healing process and increased bacterial load of the wound. This study showed that abdominal wound dehiscence is more common in patients operated for peritonitis due to hollow viscus perforation (52%). Amongst which duodenal perforation accounted for 32.26%. Other perforations which

included gastric perforation, ileal perforation, jejunal perforation accounted for 19.25%. For the patients with bowel perforation which were classified mostly into contaminated surgical wounds, the procedure performed was peritoneal lavage with perforation closure. A significant number of patients 16% (8 of 50) operated for obstretical reason like prolonged non progressing labour developed wound dehiscence. This was the second common reason for wound dehiscence followed by Intestinal obstruction in 6 out of 50 patients (12%). Most of the patients presenting with enteric obstruction underwent resection and anastomosis while remaining few were subjected to adhesiolysis and colostomy 10% of the patients had underlying malignancy. Surgery for pancreatic diseases presenting with burst abdomen accounted for 6% (3 of 50) of the cases reasons being increased bilirubin levels, hypoprotenemia, altered liver function tests. In this study, among 50 patients developing laparotomy wound dehiscence, 72% of patients were operated on emergency basis. Therefore, the effect of emergency surgery might high in this study. It has been reported though, to be a highly significant factor in other studies. In these patients, the urgent need for laparotomy precluded satisfactory preoperative preparation that includes proper bowel preparation thus leading to wound infection. Underlying pathological lesions also play an important role preventing wound healing. Multiple studies have concluded that vertical midline incision increases the risk of wound dehiscence. In this present study out of 50 patients 88.87% patients underwent surgery with vertical midline incisions and 8.4% patients with right paramedian incisions had burst abdomen, that is more than 95% patients with vertical incisions had wound dehiscence. Anatomical factors which might make a vertical upper abdominal wound more likely to burst are

• Interference with blood supply

• Rectus abdominis muscle has segmental blood supply and nerve innervations. If incision is lateral, the medial part of the rectus is denervated and later atrophies which becomes a weak spot in abdominal wall resulting in burst abdomen.

• The fibers of rectus sheath run transversely so when midline vertical incision is given these fibers are disturbed and weekend and also the anterior sheath is dethatched from its insertion

• With upper abdominal incision, the pain prevents chest movements thus increasing the likelyhood of respiratory infections and cough, this increases the intrabdominal pressure leading to tension and strain on the fresh wound.

• Elastic fibers of the skin also run transversely, so when they are cut by vertical incision, the strength of the wound is decreased

Day of presentation of abdominal wound dehiscence

Sixth to tenth day after surgery were the usual days of burst abdomen in this study 78% (39 of 50) (figure-4). Laparotomy sutures were removed on 7th or 8th post operative days. Until this time wound dehiscence remained undetected. After suture removal the burst became evident. The reason for this may be immobilisation of the patient during the postoperative period and when they begin to ambulate after suture removal and stain at stools, this leads to increased intra abdominal pressure and wound dehiscence. Anemia of hemoglobin levels less than 10 mg% will increase the incidence of wound dehiscence as decreased hemoglobin leading to increased perioperative stress, blood transfusions, and decreased tissue oxygenation, all of which can affect the immune system and the wound healing process.[11,12] Also, decreased oxygenation of tissues cause impaired angiogenesis and affect wound healing. In this study, anemia constituted to wound disruption in 63.63% of patients. Hypoprotenemia causing wound disruption was observed in 72% of patients. Protein catabolism can result in delay of wound healing. Patients with low albumin levels experience a delay in wound healing and also wound dehiscence because proteins are essential components of collagen, fibrin and extracellular matrix. Most of the hypoprotenemic patients are malnourished and also have vitamin and mineral deficiencies. Most common cause of delayed wound healing is wound infection .In this study 72%(36 out of 50) had infected wound at the time of dehiscence. Bacterial count exceeded 10^5 per gram of tissue. Continued presence of bacteria causes influx and activation of neutrophils and increases in levels of degradative matrix metalloproteinases (MMPs). In the absence of sufficient tissue inhibitors of MMPs, wound degradation will occur.[13] The release of endotoxins by bacteria leads to the production of collagenase, which degrades collagen fibers.[14] Bacteria prolong the inflammatory phase of wound healing and interfere with epithelialisation, collagen deposition and wound contraction

V. Recommendations

Better teaching and training for junior surgeons of the institute by their seniors. Proper protocol and comprehensive guidelines should be articulated and made available to all the personnel managing and treating surgical patients who require laparotomy. It should be clearly specified the best and most appropriate surgical approaches for various surgeries, choice of suture materials, style or method of wound closure. The need for requirement of drains and nasogastric tube is to be judged properly. Controversy surrounding abdominal closure in the presence of severe abdominal contamination, peritonitis and gross distension should be discussed and

clarified. The choice of best suture materials to avoid technical failure should also be stressed. The need for use of intra-abdominal absorbable mesh to prevent wound dehiscence should also be discussed.

VI. Conclusion

Various putative risk factors for abdominal wound dehiscence were investigated in the thus far largest study in the general surgical population. Important risk factors for abdominal wound dehiscence have been identified in this study, including age, gender, chronic pulmonary disease, jaundice, anemia, emergency surgery, type of surgery, coughing, and wound infection. Laparotomy wound dehiscence is more common in males when compared to females with ratio of 3.5:1. Patients in the age group of 51-60 years found to have highest incidence of abdominal wound dehiscence with the mean age reported to be 46.25 years. Incidence of abdominal wound dehiscence is more common in patients with peritonitis due to hollow viscus perforation than in case of intestinal obstruction. Patients with surgical wound classified as contaminated shows more tendency towards developing wound dehiscence. Emergency surgeries have a higher incidence of abdominal wound dehiscence than elective (2.57:1). Midline laparotomy incision carried higher risk for wound dehiscence than those operated with paramedian incisions due to poor blood supply at linea alba. BMI>25 predisposes to a higher chance of wound dehiscence than those having their BMI≤25. Patients with hemoglobin levels below 10 gm% are at a greater risk for abdominal wound dehiscence. 6th to 10th post operative day showed maximum cases of wound dehiscence. Prolonged surgery duration of more than 2 hours, along with layered closure of abdomen showed more dehiscence compared to mass closure.

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