



**Research Article**

**STUDY OF FACTORS RESPONSIBLE FOR ABDOMINAL WALL DEHISCENCE IN A TERTIARY HEALTH CARE CENTRE**

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**ABSTRACT**

Abdominal Wound Dehiscence Is one The Complication of Abdominal surgery. This study aims to identify risk factors of abdominal wound Dehiscence

**Key words:**

Abdominal Wound Dehiscence, Complications

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**INTRODUCTION**

Wound complications are important causes of early and late postoperative morbidity following laparotomy. Surgical wounds in normal, healthy individuals heal through an orderly sequence of physiologic events that include inflammation, epithelialization, fibroplasia, and maturation. Mechanical failure or failure of wound healing at the surgical site can lead to disruption of the closure leading to seroma, hematoma, wound dehiscence.

Burst abdomen is the disruption of any or all layers in an abdominal wound. It is one of the surgical complication that results from poor wound healing.

Is due to abdominal wall tension overcoming tissue or suture strength, or knot security. It can occur early or late in the postoperative period and involve a portion of the incision (ie, partial dehiscence) or the entire incision (ie, complete fascial dehiscence). The incidence of fascial disruption ranges from 0.4 to 3.5 percent depending upon the type of surgery performed [1-4]. Despite improved perioperative care and stronger suture materials, the incidence and morbidity of fascial dehiscence are largely unchanged. Although several systemic factors are associated with increased risk their clinical importance is over stated .Because of high mortality, medical and surgical preventive measures are essential in perioperative period.

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Wound sepsis associated with intra-abdominal abscess is the single most important risk factor for wound dehiscence. A number of papers on this subject identified various risk factors which can lead to this condition. This include age (>65 years), gender (male), tobacco smoking, obesity ,chronic steroid treatment, anaemia, jaundice, uraemia, diabetes, chronic obstructive pulmonary disease, neoplastic disease, wound infection, factors like anaemia, malnutrition, obesity, emergency surgery for peritonitis due to bowel perforation

**Aims and objectives of the study**

To observe risk factors in abdominal wall dehiscence in emergency laparotomy procedure.

1. To correlate type of incision
2. To correlate comorbid factors responsible and the primary disease responsible for wound dehiscence
3. To correlate nutritional status and peritoneal contamination at the time of surgery

**MATERIALS AND METHODS/STUDY DESCRIPTION**

- a. Design: Single centre, prospective observational study
- b. Place of study: LTMMC & LTMGH, Sion, Mumbai 400022
- c. Proposed duration of study: 18 months
- d. Sampling size: 60
- e. Methodology:

It is a single centre prospective observational study was done at LTMMC and LTMGH ,sion. It included All emergency laparotomy cases performed in LTMGH hospital, sion .All

patient who were willing to participate of either sex above the age of 12 years were included while patient who discontinued treatment or went against medical advice and pregnant female excluded from study. Patient included observed post consent from date of admission to date of discharge and followed up till the wound heals. A detailed history and clinical examination conducted. The data is noted on a proforma which also included all the major risk factors for wound dehiscence like age, gender, nature of disease, emergency surgery, nutritional status of patient, anaemia, jaundice, sepsis and presence of comorbidity (diabetes mellitus, hypertension, chronic obstructive pulmonary disease, steroid use, Ascitis etc) also parameters like type of incision, sutures used, pattern of closing abdomen (continuous or interrupted) and compared with those who developed abdominal wall dehiscence and those who not developed abdominal wall dehiscence. Baseline investigations and total protein, albumin/globulin ratio will be noted in all cases as well as abdominal radiographs and ultrasonography. CT scan abdomen was done when required. Postoperatively, abdominal wounds were examined from third postoperative day onwards on daily basis to see the signs of wound infection, dehiscence including redness (erythema), seroma formation, and discharge of serosanguinous fluid or pus from one or more sites.

All patients got standard care and treatment with daily dressing along with intravenous antibiotic according to culture and sensitivity.

**Inclusion criteria**

1. All patients undergoing emergency laparotomy at LTMGH above 12 years
2. either sex
3. willingness to participate in study

**Exclusion criteria**

1. All patients who discontinued treatment or went discharge against medical advice
2. Pregnant females and lactating women

**Results, Data Analysis and Interpretation**

Various patients parameters, demographic profile, lab investigations were studied. The significance and co relation of this factor for wound dehiscence was analysed using various test. Results are also depicted pictorially using graphs.

Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical Variables were determined. Association between Variables was analyzed by using Chi-Square test for categorical Variables. Bar charts and Pie charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

**Age**

All patients above 18 years of age were included in the study. The youngest to be 14 and oldest to be 83 years.

**Table 1** Distribution of Study Subjects according to their Age Group (N = 61)

| Age (in Years)   | No.           | Percent |
|------------------|---------------|---------|
| ≤ 30             | 25            | 41.0    |
| 31-40            | 17            | 27.9    |
| 41-50            | 4             | 6.6     |
| 51-60            | 9             | 14.8    |
| 61-70            | 2             | 3.3     |
| >70              | 4             | 6.6     |
| <b>Mean (SD)</b> | 37.98 (17.58) |         |
| <b>Range</b>     | 14-84         |         |

**Gender**

The following table describes distribution according to gender in which male were 36 and female were 25 in study population of 61

**Table 2** Distribution of Study Subjects according to the Gender (N=61)

| Gender | No. | Percent |
|--------|-----|---------|
| Male   | 36  | 59.0    |
| Female | 25  | 41.0    |

**Distribution According to Diagnosis**

The following table summaries patient according to diagnosis at presentation.

**Table 3** Distribution of Study Subjects according to the Diagnosis (N=61)

| Diagnosis                      | No. | Percent |
|--------------------------------|-----|---------|
| Stab Injury                    | 4   | 6.6     |
| Acute Abdomen                  | 5   | 8.2     |
| Bowel Gangrene                 | 4   | 6.6     |
| Appendicitis                   | 2   | 3.3     |
| Bile leak                      | 1   | 1.6     |
| Blunt abdominal Trauma         | 7   | 11.5    |
| Caecal Tumour with obstruction | 1   | 1.6     |
| Colonic perforation            | 1   | 1.6     |
| Degloving injury to abdomen    | 1   | 1.6     |
| Duodenal perforation           | 6   | 9.8     |
| GB perforation                 | 1   | 1.6     |
| Gastric Perforation            | 3   | 4.9     |
| Haemoperitoneum                | 1   | 1.6     |
| Intestinal Obstruction         | 10  | 16.4    |
| Intestinal Perforation         | 2   | 3.3     |
| Ischaemic Bowel disease        | 1   | 1.6     |
| Jejunal perforation            | 1   | 1.6     |
| Obstructed umbilical hernia    | 2   | 3.3     |
| Umbilical incisional hernia    | 1   | 1.6     |
| Perforative peritonitis        | 2   | 3.3     |
| Peritoneal inclusion cyst      | 1   | 1.6     |
| Rectal Perforation             | 1   | 1.6     |
| RTA with abdominal Trauma      | 1   | 1.6     |
| Ruptured appendix              | 1   | 1.6     |
| Sigmoid volvulus               | 1   | 1.6     |

**Distribution According To Surgery**

The below table enumerates the number of surgical procedures performed on our study patients

**Table 4** Distribution of Study Subjects according to the Surgery (N=61)

| Surgery                                | No. | Percent |
|--|-----|---------|
| Appendicectomy                         | 2   | 3.3     |
| Diverting stoma with wash              | 1   | 1.6     |
| EL for Hemoperitoneum with splenectomy | 2   | 3.3     |
| EL Resection & anastomosis             | 5   | 8.2     |
| EL with adhesiolysis                   | 4   | 6.6     |
| EL with cholecystectomy                | 1   | 1.6     |
| EL with closure of Perforation         | 8   | 13.1    |
| EL with closure of degloving wound     | 2   | 3.3     |
| EL with double barrel Ileostoma        | 3   | 4.9     |

|  |   |      |
|--|---|------|
| EL with grahams patch                  | 1 | 1.6  |
| EL with hartmans procedure             | 1 | 1.6  |
| EL with ileo-ascending anastomosis     |   | 0.0  |
| EL with ligation of Mesenteric Bleeder | 1 | 1.6  |
| EL with Loop Ileostoma                 | 2 | 3.3  |
| EL with Nephrectomy                    | 3 | 4.9  |
| EL with omental patch repair           | 1 | 1.6  |
| EL with Primary Closure                | 8 | 13.1 |
| EL with Primary Repair                 | 1 | 1.6  |
| EL with RA                             | 3 | 4.9  |
| EL with Reduction                      | 2 | 3.3  |
| EL with Repositioning                  | 1 | 1.6  |
| EL with resection and Stoma creation   | 2 | 3.3  |
| EL with Sigmoidostomy                  | 2 | 3.3  |
| EL with Stricturoplasty                | 3 | 4.9  |
| EL with placement of Drain             | 1 | 1.6  |

**Distribution According to Primary Organ Involved**

Following were organ involved in our study patients.

**Table 5** Distribution of Study Subjects according to the Primary Organ Involved (N=61)

| Primary Organ Involved | No. | Percent |
|------------------------|-----|---------|
| Small & Large Bowel    | 3   | 4.9     |
| Abdominal Wall         | 3   | 4.9     |
| Appendix               | 2   | 3.3     |
| Duodenum               | 1   | 1.6     |
| Gall Bladder           | 2   | 3.3     |
| Kidney                 | 3   | 4.9     |
| Large Bowel            | 4   | 6.6     |
| Liver                  | 1   | 1.6     |
| Mesentery              | 1   | 1.6     |
| Omentum                | 2   | 3.3     |
| Small Bowel            | 34  | 55.7    |
| Spleen                 | 2   | 3.3     |
| Stomach                | 4   | 6.6     |

**Distribution According To Incision**

Three incision were taken in our study namely Mcburney, midline, subcostal

**Table 6** Distribution of Study Subjects according to the Incision (N=61)

| Incision  | No. | Percent |
|-----------|-----|---------|
| McBurney  | 2   | 3.3     |
| Midline   | 58  | 95.1    |
| Subcostal | 1   | 1.6     |

**Distribution According To Type of Suture Used**

Three sutures were used to close abdomen rectus and muscle layers wherever appropriate namely polyamide (nylon), pds, vicryl

**Table 7** Distribution of Study Subjects according to the Suture to close sheath (N=61)

| Suture to close the sheath | No. | Percent |
|----------------------------|-----|---------|
| Polyamide(nylon)           | 19  | 31.1    |
| Pds                        | 34  | 55.7    |
| Vicryl                     | 8   | 13.1    |

**Distribution According to Type of Closure**

Abdomen was closed in two type continuous and interrupted.

**Table 8** Distribution of Study Subjects according to the Closure Type (N=61)

| Closure Type | No. | Percent |
|--------------|-----|---------|
| Continuous   | 15  | 24.6    |
| Interrupted  | 46  | 75.4    |

**Distribution According To Co-Morbidities**

Following co-morbid factors were taken in consideration in our study.

**Table 9** Distribution of Study Subjects according to the Comorbidities (N=61)

| Comorbidities       | No. | Percent |
|---------------------|-----|---------|
| DM                  | 19  | 31.1    |
| HTN                 | 23  | 37.7    |
| COPD                | 3   | 4.9     |
| Steroid Use         | 4   | 6.6     |
| Previous Laparotomy | 3   | 4.9     |

**Distribution According To Clinical Presentation**

The following were clinical presentation of pt at the time of surgery

**Table 10** Distribution of Study Subjects according to the Clinical Presentation (N=61)

| Clinical Presentation | No. | Percent |
|-----------------------|-----|---------|
| Ascites               | 4   | 6.6     |
| Jaundice              | 6   | 9.8     |
| Anaemia               | 16  | 26.2    |
| Uraemia               | 6   | 9.8     |
| Sepsis                | 24  | 39.3    |
| Hypoalbuminaemia      | 24  | 39.3    |

**Distribution According To Wound Dehiscence**

Patient were divided in complete and partial wound dehiscence.

**Table 11** Distribution of Study Subjects according to the Wound Dehiscence (N=61)

| Wound Dehiscence | No. | Percent |
|------------------|-----|---------|
| Yes              | 40  | 65.6    |
| No               | 21  | 34.4    |
| Complete         | 26  | 65.0    |
| Partial          | 14  | 35.0    |

**Day of Burst**

**Table 12** Distribution of Study Subjects according to the Day of Burst (N=40)

| Day of Burst | No. | Percent |
|--------------|-----|---------|
| 4-6          | 15  | 37.5    |
| 7-10         | 14  | 35.0    |
| >10          | 11  | 27.5    |

**Distribution According To Reoperated and Reburst**

**Table 13** Distribution of Study Subjects according to the Reoperated & Reburst (N=61)

| Complications | No. | Percent |
|---------------|-----|---------|
| Re-operated   | 5   | 8.2     |
| Re-burst      | 4   | 6.6     |

**Duration of Hospital Stay**

**Table 14** Distribution of Study Subjects according to the Duration of Hospital Stay (in Days) (N=61)

| Duration of Hospital Stay (in Days) | No.          | Percent |
|-------------------------------------|--------------|---------|
| ≤ 7                                 | 4            | 6.6     |
| 8-14                                | 34           | 55.7    |
| 15-30                               | 18           | 29.5    |
| >30                                 | 5            | 8.2     |
| Mean (SD)                           | 15.41 (8.61) |         |
| Range                               | 4-47         |         |

**Table 15** Distribution of Study Subjects according to the Peritoneal Contamination (N=61)

| Peritoneal Contamination (cc) | No.            | Percent |
|-------------------------------|----------------|---------|
| <100                          | 18             | 29.5    |
| 100-200                       | 20             | 32.8    |
| 200-500                       | 16             | 26.2    |
| >500                          | 7              | 11.5    |
| Mean (SD)                     | 256.72 (249.3) |         |
| Range                         | 0-1250         |         |

**Table 16** Association between Age Group and Wound Dehiscence (N = 61)

| Age (in Years) | Wound Dehiscence |           |
|----------------|------------------|-----------|
|                | Yes              | No        |
| ≤ 30           | 15 (60.0)        | 10 (40.0) |
| 31-40          | 12 (70.6)        | 5 (29.4)  |
| 41-50          | 4 (100.0)        | 0         |
| 51-60          | 4 (44.4)         | 5 (55.6)  |
| 61-70          | 2 (100.0)        | 0         |
| >70            | 3 (75.0)         | 1 (25.0)  |

Chi-Square Test, P Value = 0.345, Not Significant

No association was found with age and wound dehiscence in our study

**Table 17** Distribution of Study Subjects according to the Gender (N=61)

| Gender | Wound Dehiscence |           |
|--------|------------------|-----------|
|        | Yes              | No        |
| Male   | 24 (66.7)        | 12 (33.3) |
| Female | 16 (64.0)        | 9 (36.0)  |

Chi-Square Test, P Value = 0.829, Not Significant

No predominance was found between male and female for abdominal wall dehiscence.

**Association of wound dehiscence with type Incision**

The type of incision taken during surgery was also analysed using chi square test

**Table 18** Association between Wound Dehiscence and Incision Type (N=61)

| Incision  | Wound Dehiscence    |                    |
|-----------|---------------------|--------------------|
|           | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |
| Mcburneys | 1 (50.0)            | 1 (50.0)           |
| Midline   | 38 (65.5)           | 20 (34.5)          |
| Subcostal | 1 (100.0)           | 0                  |

Chi-Square Test, P Value = 0.690, Not Significant

using chi-square test indicating no significant difference in the proportion of patients who underwent different types of incision for the surgery in the two groups

**Association of Suture material used to close the rectus sheath**

Three type of suture material used to close rectus sheath namely polyamide (nylon) loop no.1, PDS no.1, vicryl.

**Table 19** Association between Wound Dehiscence and Suture used (N=61)

| Suture Used      | Wound Dehiscence    |                    |
|------------------|---------------------|--------------------|
|                  | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |
| Polyamide(nylon) | 11 (57.9)           | 8 (42.1)           |
| PDS              | 23 (67.6)           | 11 (32.4)          |
| Vicky            | 6 (75.0)            | 2 (25.0)           |

Chi-Square Test, P Value = 0.645, Not Significant

By chi-square test ,no significant difference was seen between use of the above mentioned sutures and wound dehiscence

**Association of Closure technique**

**Table 20** Association between Wound Dehiscence and Closure Type (N=61)

| Closure Type | Wound Dehiscence    |                    |
|--------------|---------------------|--------------------|
|              | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |
| Continuous   | 8 (53.3)            | 7 (46.7)           |
| Interrupted  | 32 (69.6)           | 14 (30.4)          |

Chi-Square Test, P Value = 0.250, Not Significant

Using chi square test no significant difference was seen in technique used to rectus

**Association of wound dehiscence and comorbidities**

**Table 21** Association between Wound Dehiscence and Comorbidities (N=61)

**Table 21 a**

| Comorbidities | Wound Dehiscence    |                    | P Value |
|---------------|---------------------|--------------------|---------|
|               | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| HTN           | 14 (60.9)           | 9 (39.1)           | 0.547   |
| No HTN        | 26 (68.4)           | 12 (31.6)          |         |

Chi-Square Test, P Value Not Significant

In above table it shows no association of HTN with that of abdominal wound dehiscence

In our study we considered BP->140/90 mm as having HTN.

**Table 21 b**

| Comorbidities | Wound Dehiscence    |                    | P Value |
|---------------|---------------------|--------------------|---------|
|               | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| DM            | 12 (63.2)           | 7 (36.8)           | 0.789   |
| No DM         | 28 (66.7)           | 14 (33.3)          |         |

Chi-Square Test, P Value Not Significant

There was not relation to be found between DM and wound dehiscence

In our study RBS>200mg/dl or FBP>110 mg/dl or PLBS>200 mg/dl was considered to be having DM.

**Table 22 C**

| Comorbidities  | Wound Dehiscence    |                    | P Value |
|----------------|---------------------|--------------------|---------|
|                | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Steroid use    | 3 (75.0)            | 1 (25.0)           | 0.681   |
| No Steroid use | 37 (64.9)           | 20 (35.1)          |         |

Chi-Square Test, P Value Not Significant

**Table 22 d**

| Comorbidities | Wound Dehiscence    |                    | P Value |
|---------------|---------------------|--------------------|---------|
|               | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| COPD          | 3 (100.0)           | 0                  | 0.198   |
| No COPD       | 37 (63.8)           | 21 (36.2)          |         |

Chi-Square Test, P Value Not Significant

| Comorbidities          | Wound Dehiscence    |                    | P Value |
|------------------------|---------------------|--------------------|---------|
|                        | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Previous Laparotomy    | 2 (66.7)            | 1 (33.3)           | 0.967   |
| No Previous Laparotomy | 38 (65.5)           | 20 (34.5)          |         |

Chi-Square Test, P Value Not Significant

Using chi-square test no significance was seen between comorbidities and abdominal wall dehiscence.

**Association of wound dehiscence and clinical presentation**

**Table 22** Association between Wound Dehiscence and Clinical Presentation (N=61)

**Table 22 a**

| Clinical Presentation | Wound Dehiscence    |                    | P Value |
|-----------------------|---------------------|--------------------|---------|
|                       | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Hypo-albuminaemia     | 24 (100.0)          | 0                  | <0.001* |
| No Hypo-albuminaemia  | 16 (43.2)           | 21 (56.8)          |         |

Chi-Square Test, P Value \*Significant

It is clear from the above statistics that there is association of hypoalbuminaemia with wound dehiscence, in our study <3.5gm/dl was considered to be having hypoalbuminaemia

**Table 22 b**

| Clinical Presentation | Wound Dehiscence    |                    | P Value |
|-----------------------|---------------------|--------------------|---------|
|                       | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Anaemia               | 14 (87.5)           | 2 (12.5)           | 0.032*  |
| No Anaemia            | 26 (57.8)           | 19 (42.2)          |         |

Chi-Square Test, P Value \*Significant

The statistical analysis shows significant association of anaemia with wound dehiscence out of 16 pt. who were anaemic developed 14 developed wound dehiscence which is statistically significant.

In our study Hb <10 gm/dl was considered to be having Anaemia

**Table 22 c**

| Clinical Presentation | Wound Dehiscence    |                    | P Value |
|-----------------------|---------------------|--------------------|---------|
|                       | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Uraemia               | 3 (50.0)            | 37 (67.3)          | 0.398   |
| No Uraemia            | 3 (50.0)            | 18 (32.7)          |         |

Chi-Square Test, P Value \*Significant

Out of 40 pt who had uraemia 3 pt developed wound dehiscence which was statistically not significant. In our study uraemia was considered if BUN >20 plus symptoms such as anorexia, fatigue, uremic encephalopathy, altered sensorium.

**Table 22 d**

| Clinical Presentation | Wound Dehiscence    |                    | P Value |
|-----------------------|---------------------|--------------------|---------|
|                       | Yes (n=40)<br>n (%) | No (n=21)<br>n (%) |         |
| Sepsis                | 23 (95.8)           | 1 (4.2)            | <0.001* |
| No Sepsis             | 17 (45.9)           | 20 (54.1)          |         |

Chi-Square Test, P Value \*Significant

Sepsis is considered to be the important risk factor for abdominal wall dehiscence.

In our study 24 pt. had sepsis out of which 23 developed wound dehiscence

Sepsis

1. Temperature > 38 or <36 degree Celsius
2. Heart rate > 90 beats/ min
3. Respiratory rate > 20 breaths/min or Paco2 <32 mmHg

4. Wbc counts < 4000 or > 12000 cells/ mm3

**Peritoneal contamination**

Association of amount of peritoneal contamination with abdominal wall dehiscence was done

**Table 23** Association between Wound Dehiscence and Peritoneal Contamination (N=61)

| Wound Dehiscence | Peritoneal Contamination |        |
|------------------|--------------------------|--------|
|                  | Mean                     | SD     |
| Yes              | 293.75                   | 297.84 |
| No               | 186.19                   | 74.19  |

Unpaired t Test, P Value = 0.116, Not Significant

Using unpaired t test, no significant correlation was found between wound dehiscence and peritoneal contamination

**DISCUSSION**

In our study various risk factors that were responsible for abdominal wound dehiscence were observed. Various parameters like Age, sex, primary organ involved, Type of sutures used, Co-morbid factors i.e. (Hypertension, Diabetes mellitus, steroid, COPD, Ascites, Jaundice, Uraemia, Anaemia, sepsis, hypoalbuminaemia wound dehiscence, Re-exploration) were studied. We came to conclusion that comorbid factors such as Anaemia, Sepsis, and Hypoalbuminaemia were the major risk factors

**Age**

In 2005, Rodriques Hermoza (6) did retrospective study on 12,622 patients over 9 years and found that incidence of wound dehiscence was more in age more than 65 years.

Between 2001 and 2007, 3500 abdominal laparotomies were performed in the Department of surgery of Mesologgi General Hospital and urban community teaching hospital of 150 bed. Fifteen patients were reported with complete wound dehiscence. Age > 70 years are described as risk factor (7)

Study was carried out at Nishter Hospital Multan between May 1998 to May 2000. This study was carried out on 406 patients who underwent laparotomy for intra peritoneal procedure and complied with inclusion criteria. With age >55 years described as risk factor. (8)

In our study however we could not establish any relation between age and abdominal wall dehiscence and needs further evaluation.

**Gender**

Study was carried out at Nishter Hospital Multan between May 1998 to May 2000. This study was carried out on 406 patients who underwent laparotomy for intra peritoneal procedure and complied with inclusion criteria. Demographic features were recorded and any complications documented Out of a total of 406 patients, 32 showed wound dehiscence giving an overall frequency of 7.8%. The male to female ratio was 2.8:1. The frequency was greater in males than in females (8)

In a study conducted between Jan 1985 to Dec 2005 at Department of Surgery, Erasmus University Medical Center, male were 75% and female pts 25%. (9)

In our study no such frequency attributed to any one gender was found probably due to less number of subject cases.

### **Primary Organs Involved In Surgery**

In 1963, Hampton in his study of burst abdomen which occurred in the United Oxford Hospitals. In the 012 years 1949-60 showed that there was a high frequency of burst after operations on the stomach and biliary tract

However in our study more dehiscence was seen in patient operated for small bowel. This difference can be due to different rate of admission of different patients with various diseases

### **Day of Burst**

Study of burst abdomen: it's causes and management conducted in dept of surgery in gmc gondia and Nagpur, india by N. K. Jaiswall, Sandeep Shekhar. Total of 82 cases were included in this prospective study The majority of burst abdomen occurred between 7 th and 10th post-operative day.<sup>(10)</sup>

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 The majority of burst abdomen occurred between 7th and 10th post-operative day, with the highest incidence on the 7th post-operative day.<sup>(12)</sup>

In our study day of burst abdomen were between 4-6 days

### **Partial Or Complete Burst**

The present study was conducted among 162 patients underwent laparotomy by midline incisions in the Department of General Surgery and Obstetrics and Gynaecology, Chhattisgarh Institute of Medical Sciences, Bilaspur, Chattisgarh, India 47% of the patients had partial burst and 53% had complete burst<sup>(11)</sup>

In present study, 40 patients out of 26 (65%) had complete burst involving the whole length of the wound while 14 patients out of 40 (35%) had partial burst.

### **Association With Incision**

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.<sup>(12)</sup>

In 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%).

Study conducted in Department of Surgical Gastroenterology, University of Copenhagen, Hvidovre Hospital in 2001, shows that the incidence of abdominal wound dehiscence and burst abdomen is more common in patients with vertical incision than in those with transverse incision ( $p=0.0001$ ).<sup>(20)</sup>

In our study on preliminary observations, midline incision majority burst abdomen occurred in vertical midline incision as most of the incision were vertical midline incision

--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 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 intra-abdominal 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

Undue tension over the stitches and increased intra-abdominal pressure due to peritoneal fluid; drainage relieves the tension.

The majority of the abdominal surgeries are done with vertical midline incision in our hospital.

### **Suturing Technique**

(In may 1997)Department of Obstetrics and Gynaecology, Third Branch of the University of Milan, San Gerardo Hospital, Monza, Italy. A randomized comparison of continuous versus interrupted mass closure of midline incisions in patients with gynecologic cancer<sup>(14)</sup>

Continuous and interrupted mass closures were compared randomly in 632 patients. Both methods were performed with absorbable material. Of the 614 subjects who could be evaluated, 308 underwent a continuous, non-locking closure with looped polyglyconate suture, and 306 were closed with interrupted polyglycolic acid according to the Smead-Jones technique. Three (1%) subjects with the continuous closure and five (1.6%) with the interrupted closure had an abdominal wound infection ( $P = .50$ ). One patient whose incision was closed with continuous suturing had a deep wound dehiscence (without evisceration). The follow-up period was 6 months to 3 years. No patient had evidence of chronic sinus drainage. Thirty-two (10.4%) of the patients who had the continuous closure and 45 (14.7%) of those who were closed with the interrupted method had evidence of incisional hernia ( $P = .14$ ). No hernia developed in any patient with a wound infection. Four (1.3%) hernias after the continuous closure and eight (2.6%) after the interrupted closure required surgical repair because of patient discomfort ( $P = .38$ ) The interrupted closure was not superior to the continuous closure for short- and long-term wound security. The continuous method was preferable because it was more cost-efficient and faster.

A 2017 Cochrane review of 55 randomized trials (19,174 patients) compared absorbable continuous versus interrupted closure. In this study both did not impact on wound dehiscence.<sup>(15)</sup>

As per our study type of closure did not have any impact on wound dehiscence. This could be due to the fact that less number of patients had undergone closure in continuous manner.

### **Sutures Used**

A 2017 Cochrane review of 55 randomized trials (19,174 patients) compared absorbable versus nonabsorbable sutures, continuous versus interrupted closure, mass versus layered closure, monofilament versus multifilament sutures, and slow versus fast absorbable suture in terms of incisional hernia (at one year), wound infection, wound dehiscence, wound sinus, or fistula formation. The only significant findings were that monofilament sutures may reduce the risk of incisional hernia (relative risk 0.76, 95% CI 0.59-0.98), and that absorbable sutures may reduce the risk of sinus or fistula tract formation (relative risk 0.49, 95% CI 0.26-0.94). However, only about half of the included trials (26) enrolled patients who underwent midline incisions exclusively; the others included patients who underwent paramedian, subcostal, or transverse incisions. No significant association with absorbable and non-absorbable sutures with wound dehiscence<sup>(15)</sup>

In our study we used both monofilament and polyfilament sutures could not find any any impact on abdominal wall dehiscence

### **Diabetes Mellitus**

In 2013 Endara<sup>(13)</sup> did study on seventy-nine patients with diabetes and found that rate of wound dehiscence was more in diabetic patients. Preoperative and postoperative hyperglycaemia (defined as any blood glucose measurement above 200 mg/dl) as well as elevated HbA1C levels (above 6.5 percent or 48 mmol/ml) were significantly associated with increased rates of dehiscence (odds ratio, 3.2,  $p = 0.048$ ; odds ratio, 3.46,  $p = 0.028$ ; and odds ratio, 3.54,  $p = 0.040$ , respectively). Variability in preoperative glucose (defined as a range of glucose levels exceeding 200 points) was significantly associated with increased rates of reoperation (odds ratio, 4.14,  $p = 0.025$ ) and trended toward significance with increased rates of dehiscence ( $p = 0.15$ ). In multivariate regression, only perioperative hyperglycaemia and elevated HbA1c were significantly associated with increased rates of dehiscence. In primary closure of surgical wounds in high-risk patients, poor glycaemic control is significantly associated with worse outcomes. Every effort should be made to ensure tight control in both the chronic and subacute perioperative periods. It is believed that diabetes influences wound healing due to increased propensity for infection. Atherosclerosis and high sugar level favours bacterial invasion. Uncontrolled infection leads to collection of pus and resultant tissue tension leading to separation of wound edges.

In study conducted at mesologgi hospital<sup>(7)</sup> Diabetes is described as risk factor.

In our study out of 19 diabetic patients only 12 patient had developed wound dehiscence. However it was statistically not significant.

### **Steroid Use**

Steroids inhibit primary wound healing and delay the formation of granulation tissue, but it has been controversial whether long-term steroid treatment by itself increases the risk of abdominal wound dehiscence. The aim of this study was to

determine whether the pre-operative dose and post-operative total dose of steroids influence abdominal wound dehiscence was done by akio kihara. Of 28 patients who had surgery while receiving long-term steroid treatment, seven had abdominal wound dehiscence and 21 did not have dehiscence. The two groups differed significantly in the post-operative dose of steroids and the duration of wound healing, but no other differences were found.<sup>(6)</sup>

Study at mesologgi hospital<sup>(7)</sup> also showed Steroid treatment in the last 12 months as estimated as risk factor.

Our study also did not show any role of steroids with wound dehiscence as in our study, steroid intake with wound dehiscence occurred in 3 patients only

### **COPD**

COPD patients had chronic cough which post operatively raises intra-abdominal pressure leading to wound dehiscence The study conducted in Department of surgery of Mesologgi General Hospital from 2001-2007 pt having COPD had increased risk of wound dehiscence<sup>(7)</sup>

In 2009 John spiliotis<sup>(17)</sup> in his study on 3500 patient found that 67% of wound dehiscence patient had COPD. COPD patients are usually smokers. Hence smoking is indirect cause of wound dehiscence.

In our study there was no role of COPD on wound dehiscence. In our study there were only three COPD patients out of which three patient had wound dehiscence. No correlation was found as study included only 3 COPD patients

### **Jaundice**

Patients with hyperbilirubinemia have poor wound healing and increased risk of wound dehiscence In 2005, Waqar SH<sup>(18)</sup> in a study of 117 patients found that patients with jaundice had post operatively developed wound dehiscence.

Jaundice predisposes a patient to wound dehiscence by slowing the healing, and increasing rate of wound infection. However in our study there was no significant role of jaundice in developing wound dehiscence. This difference might be due to impact of other variables in wound dehiscence patients

In our study, six patient with jaundice developed abdominal wall dehiscence however if did not have correlation with wound dehiscence

### **Hypoalbuminemia**

In our study of 61 patients, 24 patients had hypoalbuminemia out of which 24 patients developed wound dehiscence. From our study it indicates that wound dehiscence is commonly associated with low level of pre-operative serum albumin levels.

Albumin is the most abundant protein found in plasma. It is synthesized in liver with a half-life of 20 days and serum concentration of 3.5 to 5 grams/Dl. Tissue repair depends mostly on sulphur containing amino acids like methionine and cysteine. These amino acids are inadequate in malnourished hypoprotemic patients. These amino acids are required for sulfation of mucopolysaccharide ground substance. This results in poor wound healing. Hence it is essential that pre-operative serum albumin to be more than 3.5 gm/dL

In 2001, Russel L<sup>(21)</sup> in his study he found that low albumin and nutrition were important factor responsible for wound healing and wound dehiscence.

In 2010, Gabreile H, found in his study that low protein and albumin levels and deficiencies of several vitamins and minerals such as vitamins A, B1, B2, B6, C and 46 zinc and copper have been associated with poor wound repair. Data on preoperative albumin levels were available for 83% of patients with abdominal wound dehiscence and 56% of controls. Albumin levels were below 3.5 g/l in 63% of patients with abdominal wound dehiscence and 34% of controls, which was significantly less ( $P < 0.001$ ) and suggestive of an association between low albumin levels and development of abdominal wound dehiscence. The study at mesologgi hospital also showed low albumin levels to be risk factor for wound dehiscence<sup>(7)</sup>. Malnutrition, the total serum albumin level less than 3.0 mg/dl and the decrease of body weight more than 10% in the last 10 months are estimated as risk factors

In a study carried out at Oula University Hospital, among 48 patients who developed wound dehiscence, there were 31 (65%) patients with pre-operative hypoalbuminemia<sup>(19)</sup>

### **Uremia**

Clinically though rise in blood urea nitrogen increases chances of wound dehiscence, our study doesn't support uremia to be cause of wound dehiscence. Serum urea also inhibits growth of fibroblast.

In a study carried out at Oula University Hospital<sup>5</sup>, among 48 patients who developed wound dehiscence Risk factors like use of Uremia were not present<sup>(19)</sup>

In 1992, Jean perre in a study of 2671 patient found that uraemia was significant factor for wound dehiscence. Uraemia is a condition in which there is rise in BUN and serum creatinine above the normal. Uraemia if not corrected leads to renal failure, sepsis and ultimately impaired wound healing. However in our study uraemia was not significant factor for wound dehiscence as our study was done on only 40 patient who were uremic patients but only 3 developed wound dehiscence while above mentioned study was done on 2671 patients.

### **Anemia**

Nutritional anaemia is directly related to wound healing. In 2001, Russel L<sup>(21)</sup> in his study found that anaemia and poor nutrition were important factor responsible for wound healing and wound dehiscence. In a study carried out at Oula University Hospital, among 48 patients who developed wound dehiscence, other risk factors also included anemia.<sup>(19)</sup>

The study at mesologgi hospital<sup>(7)</sup> concluded that Anaemia, Hb < 10 mg/dl is described as risk factor

In our study out of 61 patient 16 patient had anaemia out of which 14 developed wound dehiscence giving evidence that anaemia at presentation plays major role in wound dehiscence

**Sepsis.** In 1997 Thornton FJ<sup>(22)</sup>, in his study found that endotoxins and cytokines associated with sepsis induce nitric oxide synthesis both systemically and locally within colonic tissue. Hence patients with sepsis have poor wound healing and can pre dispose to wound dehiscence.

A Clinical Study has been conducted at Department of General Surgery, MVJ Medical College and Research Hospital, Bangalore, India. On patients admitted from November 2012 to May 2015 found intrabdominal sepsis most important cause of abdominal wall dehiscence.<sup>(23)</sup>

The study at mesologgi hospital also signified that sepsis to be major risk factor for abdominal wall dehiscence

In our study it is clear that patients in sepsis had more chances of developing wound dehiscence. Out of 61 pt 24 had sepsis and 23 developed wound dehiscence. Sepsis is defined as a documented or suspected infection with some findings of SIRS.

### **Criteria for SIRS**

1. Temperature > 38 or < 36 degree Celsius
2. Heart rate > 90 beats/ min
3. Respiratory rate > 20 breaths/min or Pao<sub>2</sub> < 32 mmHg
4. Wbc counts < 4000 or > 12000 cells/ mm<sup>3</sup>

### **Ascitis**

From January 1985 to December 2005, 429,906 operative procedures were performed at the department of surgery study done by Gabriëlle H. van Ramshorst<sup>(24)</sup>. In 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 case-control study was ascites also including other risk factors

Our study also did show any role of ascites with wound dehiscence which might be due to fact that patients in our study group might have had mild ascites.

Ascites raises intra-abdominal pressure and can lead to wound dehiscence.

In 2004, Mukthair did a study and found that ascites was independent factor for wound dehiscence.

### **Previous Laparotomy**

As per our study there was no significance of previous laparotomy on wound dehiscence. This could be due to fact that patients in our study group might have been well optimised after surgery.

In 2014, Jakub<sup>(25)</sup> did a study on 1879 patients and observed that wound dehiscence was more in patients who had undergone laparotomy, prior to present surgery

### **Peritoneal Contamination**

Study conducted on 107 patients with abdominal wound dehiscence over a period of 7 years in Department of Surgery, Cleveland Veterans Affairs Medical Centre, Case Western Reserve University USA by Graham et al<sup>(26)</sup>, showed that patients with Intra-abdominal infection were more likely to have undergone an emergency operations ( $p < 0.02$ ), wound dehiscence is more common in emergency operations and operations with higher wound classification

In our study peritoneal contamination ranged from 0-1250 cc with mean of 256.7 cc. Even though wound dehiscence occurred in patient whose contamination found to be more than who did not it was not statistically significant



### Redehiscence

Among the patients who were re-operated for wound dehiscence, none of them developed re dehiscence. This could be because these patients were nutritionally built up during the course in ward. They were given regular dressings and were given antibiotics as per culture and sensitivity. Since nutrition and wound infection plays major role in wound dehiscence, these two factors were given emphasis and hence on re operating the patients again they did not develop wound dehiscence.

### SUMMARY AND CONCLUSION

1. Burst abdomen is the disruption of any or all layers in an abdominal wound. It is one of the surgical complication that results from poor wound healing.
2. Important risk factors for wound dehiscence are Jaundice, Sepsis, Hypo Albuminuria and Anaemia.
3. Wound dehiscence is one of important factor responsible for long indoor stay.
4. Complications include intestinal fistula, incisional hernia, bleeding and infections.
5. As per our study **HYPOALBUMENIA** and **SEPSIS, ANEMIA** were important factor responsible for wound dehiscence. Hence we can conclude that we can avoid wound dehiscence by correction pre-operative serum albumin level and controlling sepsis by proper antibiotics and hydration

### References

1. ACUTE WOUND FAILURE From the Department of Surgery, University of Texas Southwestern Medical Center at Dallas, Dallas, Texas
2. Abdominal wound disruption. AU Baggish MS, Lee WK
3. Wound healing: evisceration Pratt J Am J Obstet Gynecol. 1973; 132:165.
4. Abdominal wound dehiscence in adults: development and validation of a risk model. van Ramshorst GH, Nieuwenhuizen J, Hop WC, Arends P, Boom J, Jeekel J, Lange JF World J Surg. 2010;34(1):20.
5. Fernandez L, Norwood S, Roettger R, Wilkins HE 3rd. Temporary ntravenous bag silo closure in severe abdominal trauma J trauma, 1996;40(2):258
6. Rodriguez-Hermosa JI1, Codina-Cazador A, Ruiz B, Roig J, Gironès J, Pujadas M, Pont J, Aldeguer X, Acero D Cir Esp. 2005 May;77(5):280-6.
7. Wound dehiscence: is still a problem in the 21th century: a retrospective study John Spiliotis, corresponding author1 Konstantinos Tsiveriotis,1 Anastasios D Datsis,1 Archodoula Vaxevanidou,2 Georgios Zacharis,1 Konstantinos Giafis,3 Spyros Kekelos,1 and Athanasios Rogdakisl
8. Frequency and risk factor of abdominal wound dehiscence. J Coll Physicians Surg Pak; 2004 Jun; 14(6) 355-7
9. Abdominal wound dehiscence in adults: development and validation of a risk model. van Ramshorst GH1, Nieuwenhuizen J, Hop WC, Arends P, Boom J, Jeekel J, Lange JF.

10. Study of burst abdomen: it's causes and management N. K. Jaiswal, Sandeep Shekhar in dept of surgery in gmc gondia and Nagpur ,india by N. K. Jaiswal1, Sandeep Shekhar
11. Burst Abdomen: A Post-operative Morbidity Pradeep Soni1, Vibha Baghel Haripriya2, Anil Haripriya1, Vishnu Dutt3
12. G Parmar, A Gohil, V Hathila. Burst Abdomen – A Grave Postoperative Complication. The Internet Journal of Surgery. 2008 Volume 20 Number 1.
13. Endara M1, Masden D, Goldstein J, Gondek S, Steinberg J, Attinger C Plast Reconstr Surg. 2013 Oct;132(4):996-1004. doi: 10.1097/PRS.
14. A randomized comparison of continuous versus interrupted mass closure of midline incisions in patients with gynecologic cancer panel Mario Colombo MD Angelo Maggioni MD Gabriella Parma MD Salvatore Scalabrino MD Rodolfo Milani MD
15. Closure methods for laparotomy incisions for preventing incisional hernias and other wound complications <https://doi.org/10.1002/14651858.CD005661.pub2>
16. Spiliotis J1, Tsiveriotis K, Datsis AD, Vaxevanidou A, Zacharis G, Giafis K, Kekelos S, Rogdakis A. World J Emerg Surg. 2009 Apr 3;4:12. doi: 10.1186/1749-7922-4-12.
17. Waqar SH1, Malik ZI, Razaq A, Abdullah MT, Shaima A, Zahid MA. J Ayub Med Coll Abbottabad. 2005 Oct-Dec;17(4):70-3
18. Grantcharov TP, Rosenberg J. Vertical compared with transverse incision in abdominal surgery. Eur J Surg 2001 Apr; 167(4): 260-7.
19. Granam DJ, Stevenson JT, Mettenry CR. Association of intrabdominal infections and abdominal wound dehiscence. Am Surg 1998 Jul; 64(7): 660-5
20. Russell L1. Br J Nurs. 2001 Mar;10(6 Suppl):S42, S44-9
21. Thornton FJ1, Ahrendt GM, Schäffer MR, Tantry US, Barbul A. J Surg Res. 1997 Apr;69(1):81-6
22. Wound Dehiscence Still A Post-Operative Morbidity: A Retrospective Study Arunabha Sinha<sup>1</sup>, Jayanth D. H<sup>2</sup>, Prasoon Saurabh<sup>3</sup>, Srihari S. R<sup>4</sup>, Uthraa R. T<sup>5</sup>
23. Abdominal Wound Dehiscence in Adults: Development and Validation of a Risk Mod Gabriëlle H. van Ramshorst Jeroen Nieuwenhuizen Wim C. J. Hop Pauline Arends Johan Boom Johannes Jeekel Johan F. Lange
24. jakub kenig, piotr rischter, anna lasek, katarzyna zbierska and Sabina zurawska kenig et al. BMC surgery 2014
25. Peritoneal contamination Graham DJ, Stevenson JT, McHenry CR, Lucas C, Smathers HM. The association of intra-abdominal infection and abdominal wound dehiscence/Discussion. Am Surgeon. 1998;64(7):660-5

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