



## A STUDY OF ABDOMINAL WOUND DEHISCENCE WITH CLINICAL SIGNIFICANCE

<b>Dr. K. Visweswara Rao</b>	Associate Professor Department of General Surgery Alluri Sitarama Raju Academy of Medical Sciences Eluru - 534005 West Godavari District, Andhra Pradesh, India
<b>Dr. B. Sandeep*</b>	Assistant Professor Department of General Surgery Alluri Sitarama Raju Academy of Medical Sciences Eluru - 534005 West Godavari District, Andhra Pradesh, India *Corresponding Author
<b>Dr. V. Sravya</b>	Postgraduate Department of General Surgery Alluri Sitarama Raju Academy of Medical Sciences Eluru – 534005, West Godavari District, Andhra Pradesh, India
<b>Dr. D Sowmya</b>	Postgraduate Department of General Surgery Alluri Sitarama Raju Academy of Medical Sciences Eluru – 534005, West Godavari District, Andhra Pradesh, India

**ABSTRACT** Abdominal wound dehiscence is a preventable complication, but still seen. When present, it poses problems in the management of the case by increasing the morbidity and mortality. In this study, 291 major laparotomies were followed between 1st September 2013 - 31st August 2015 to find out the incidence, common pathologies of wound dehiscence and to statistically signify the risk factors causing wound dehiscence and to evaluate the role of tension sutures in prevention of wound dehiscence.

**KEYWORDS :** Abdominal wound dehiscence, Burst abdomen, Incisional hernia

### INTRODUCTION:

Abdominal wound dehiscence is defined as postoperative wound separation that involves all the layers of the abdominal wall. Dehiscence of an abdominal wound may be partial or complete.<sup>1</sup> It is partial when one or more layers have separated but either the skin or the peritoneum remains intact, with rapid development of an often massive full length incisional hernia. When it is complete, all the layers the abdominal wall have burst apart, and this may or may not be associated with viscous evisceration.

"The elimination of post-operative wound dehiscence is entirely within the jurisdiction of the operating surgeon." NORRIS-1939.

Wound disruption is a grave and a tragic complication that may follow any abdominal operation in either sex at any age, and when it occurs, it presents many serious problems in management of the case.<sup>1</sup>

The three main problems a surgeon thinks of while closing abdominal incisions are burst abdomen, in which the whole wound breaks down and bowel may appear on the surface; Incisional hernia where, the underlying muscle & fascia give way but the skin remains intact; and sinus formation in which there is a discharging sinus usually related to infection and suture material.<sup>2</sup>

Despite progresses made in perioperative and postoperative care, over the past few decades, wound dehiscence continues to be a challenging complication, which considerably prolongs hospital treatment and may be associated with mortality rates of about 10% to 44%.<sup>1</sup>

Closure of abdomen wall is a routine procedure and is probably the first major technique a surgical trainee learns during his surgical training. Although there are surgical traditions determining the choice of the method of closure, there are both local and systemic factors that influence wound dehiscence. No single etiology is incriminated to cause wound dehiscence, it is caused by a large number of factors. And more over the effect of each variable is small in relation to the sum of others; this makes it more challenging to analyse the different factors causing wound dehiscence.

### AIMS AND OBJECTIVES:

- To determine the incidence of abdominal wound dehiscence in Alluri Sitarama Raju Academy of Medical Sciences, Eluru.
- To identify the common pathologies causing wound dehiscence.
- To study the significance of the different risk factors in the development of wound dehiscence.
- To identify patients who may benefit from the use of tension sutures.

### MATERIALS AND METHODS:

This is a prospective study, where two hundred and ninety one (291) major laparotomies were followed from 1<sup>st</sup> September 2013 – 31<sup>st</sup> August 2015. The number of cases developing abdominal wound dehiscence during this period was 21. From the remaining 270 patients, 58 patients were chosen as controls (Patients undergoing the similar procedure but without dehiscence). A case-control study was undertaken and using statistical data, each factor was studied individually, for its causative role in the development of abdominal wound dehiscence.

**Exclusion criteria:** Patients undergoing Appendectomy through the gridiron incision, herniorrhaphy and minor abdominal procedures were excluded from the study. Although dehiscence and herniation of such incisions may occur, they are extremely rare. Their inclusion would dilute the incidence and make comparisons less accurate.

**Factors under study:** Of the different factors causing wound dehiscence. 8 factors were selected.

### The factors are:

- Age
- Sex
- Emergency verses elective
- Type of incision
- Type of closure
- Tension sutures
- Primary diagnosis
- Wound Infection

In each group (cases and controls), the number of patients having the particular factor in question was calculated. Each factor was analyzed for its test of significance, using chi-square or Fisher's test. A factor was considered significant if P was < 0.05.

**OPERATIVE TECHNIQUES:** In the operation theatre, the part was prepared and draped. General anaesthesia was used in most of the cases. Drains were used wherever necessary, through a separate stab incision, away from the main incision.

### The following points were paid special emphasis:

- The type of incision: midline, paramedian or transverse
- The technique of closure: Mass closure, 2 layered closure.

**Mass Closure:** All layers of the abdomen, excluding skin, subcutaneous tissue were closed using prolene. Keeping 1 cm apart and 1 cm wide.

**Layered Closure:** Using catgut for peritoneum and posterior rectus. Prolene for anterior rectus.

3. The use of tension sutures, if any was noted.

Tension Sutures: were applied using No.2 silk included all layers of abdominal wall, including the skin and the peritoneum. Bites were taken 2.5 cm from the skin edge on each side and 2.5 cm apart. Rubber tubing were used to prevent sutures cutting through.

**Postoperative period:**

The patient was followed post-operatively till all the abdominal sutures were removed. The post-operative complications like wound infection or wound dehiscence was noted. If the patient developed wound dehiscence, he was classified under the "case" group, otherwise under the "control" group. If the patient died before suture removal, he/she was excluded from the study. Patients undergoing wound dehiscence were treated following the standard guidelines.

**RESULTS:**

Of the different factors causing wound dehiscence, 'fifteen' factors were analysed for their role in the development of wound dehiscence.

**The results have been discussed under the following headings:**

- Incidence of wound dehiscence;
- Primary etiology;
- Age;
- Sex ;
- Surgical techniques ie., Type of incision
- & Type of closure;
- Wound Infection;
- Emergency vs Elective;
- Tension sutures.

1. Out of the 291 major laparotomies which were followed, 21 patients developed wound dehiscence. The incidence of wound dehiscence was found to be 7.2%.
2. Peritonitis or any other cause associated with intra-abdominal sepsis, increases the incidence of wound dehiscence.

Diagnosis	Dehiscence group (n=21)	Control group (n=58)
<i>Peritonitis</i>		
Duodenal perforation	2	20
Gastric perforation	1	2
Ileal perforation	7	4
Appendicular perforation	2	4
<i>Malignancy</i>		
Colorectal cancer	2	5
<i>Biliary disease</i>		
Cholecystitis	1	10
<i>Miscellaneous</i>		
Small Bowel Obstruction	3	6
Acute intussusception	1	5
Ruptured hydatid cyst	1	1
Gangrene of small bowel	1	1

*\*NOTE: The diagnosis of cases developing dehiscence was recorded, and then from the remaining patients controls were chosen who underwent the same procedure but did not develop dehiscence.*

It is seen from the above table that we see a large number of cases of peritonitis (n=42), which have intra abdominal sepsis and have a higher incidence of dehiscence. Ileal perforation due to enteric fever, presents with faecal contamination, and has a higher incidence of dehiscence.

3. Age of the patient more than 50years was a significant risk factor for the development of dehiscence.

Risk factor	Dehiscence group	Control group
Age > 50years	10 (48%)	14 (24%)
Age < 50years	11 (52%)	44 (76%)

Using Chi-square, p = 0.044 (p < 0.05) ie., significant.

4. There is a higher incidence of wound dehiscence in males.

Sex	Dehiscence group	Control group
Male	16 (76%)	42 (72%)
Female	5 (24%)	16 (28%)

Using chi-square, p was not found to be significant. However, there is a higher incidence of wound dehiscence in males.

5. Surgical techniques; midline incisions with mass closure using non absorbable suture material (prolene) is the near ideal way to prevent wound dehiscence.

Association with type of incisions -

Incisions	Dehiscence group	Control group
Midline	19 (90%)	54 (93%)
Paramedian	2 (10%)	4 (7%)

Using Chi-square test, p = 0.65 (p > 0.05) ie., not significant.

Association with type of closure -

Closure	Dehiscence group	Control group
Layered	12 (57%)	36 (62%)
Mass	9 (43%)	22 (38%)

Using Chi-square test, p = 0.0020 (p < 0.05) ie., significant.

6. Wound infection was a highly significant factor for wound dehiscence occurrence. Patients with wound infection were 8 times at more risk of developing dehiscence.

Association with wound infection -

Wound infection	Dehiscence group	Control group
Present	12 (76%)	14 (10%)
Absent	9 (24%)	44 (90%)

Using Chi-square test, p = 0.0001 (p < 0.05) ie., significant.

7. A higher incidence of postoperative wound dehiscence in emergency than in elective cases but wasn't statistically significant.

Association with elective vs emergency procedures -

Nature of surgery	Dehiscence group	Control group
Emergency	20 (95%)	53 (91%)
Elective	1 (5%)	5 (9%)

Using Chi-square test, p = 1 (p > 0.05) ie., not significant.

8. The use of tension sutures (at the time of closure) has shown to decrease the incidence of dehiscence.

Association with type of incisions -

	Tension sutures	No-tension sutures
Cases (79)	30	49
Dehiscence	6	23
%	20%	47%

The use of retention sutures have reduced the incidence of wound dehiscence from 47% to 20%.

**DISCUSSION:**

**Incidence of wound dehiscence:**

Incidence in this series is 7.2%. Most of the patients are >50 years, operated on emergency basis, with intraabdominal sepsis & postoperative wound infections contributing to higher incidence of wound dehiscence. Riou et al<sup>1</sup>, had a incidence of only 1% but there patient profiles are different, with only 2 cases of peritonitis being operated and one patient developed wound dehiscence. Whereas, in our series we had 42 cases of peritonitis of which 12 patients developed wound dehiscence. S.K. Mathur et al<sup>2</sup> has reported a dehiscence rate of 5% in Delhi and 7% in Surat.

**Age:**

This study shows that age > 50 years is a risk factor for wound dehiscence, in patients undergoing major abdominal surgery comparable with Riou et al study<sup>1</sup> with age > 65 years significant and Irvin et al study<sup>3</sup> (2008) with age > 50 years significant.

**Sex :**

Patients with wound dehiscence were nearly three times more likely to be males than females. Nonetheless the sex of the patient as an independent risk factor cannot be controlled by surgeon. Mayo and Lee<sup>6</sup> attributed the male predominance to abdominal breathing, greater physical activity and less elasticity of the abdominal wall. Different series showing male predominance are: Keill RH<sup>7</sup> (2003), Roui et al<sup>3</sup> (1992), Banerjee et al<sup>8</sup> (1983), Pennineckx et al<sup>9</sup> (1979).

**Wound Infection:**

Wound infection was found to be a very important variable for wound dehiscence in this series. This factor occurred about 8 times more frequency in the dehiscence group than in the control group. Suppurative wounds cause violent local inflammation and tissue destruction. In Greenburg et al study<sup>10</sup> (1979), wound infection occurred about with 11 times more frequency and Navsaria et al study<sup>11</sup> (2013), with 4 times more frequency in the dehiscence group than in the control group. Buknell et al<sup>12</sup> showed in a clinical and experimental study that infection causes decreases in tensile strength and fibroblast concentration.

**Surgical techniques:**

The type of incision and type of closure are the factors that can most easily be influenced by the surgeon.

**Type of incision:** No significant difference was found between patients undergoing midline incisions or paramedian incisions. H. van Ramshorst<sup>13</sup> (2010) noted that upper abdominal midline incisions are more proven to disruption than lower ones because of the relative fixation of the upper abdominal musculo-aponeurotic layers to the narrow angle between the ribs. Keill RH et al<sup>8</sup> (2003) noted lower incidence of dehiscence in transverse incisions as compared with those found in midline or paramedian incisions. These statements were based on collected statistics, but failed to take into account that midline incisions were often employed to gain rapid access to the abdomen in emergency situations. Transverse incisions tend to be used in elective procedure and not in emergency situations. Several controlled studies by Luijendijk RW<sup>14</sup> (2007), Hodgson NC<sup>15</sup> (2000), Riou et al<sup>3</sup> (1992), noted that there is no difference in disruption between transverse and midline incisions. In addition, Ellis H et al<sup>16</sup> (1977) demonstrated experimentally that the 2 incisions have similar bursting strengths.

**Type of closure:** Wound dehiscence occurs 7-10 days postoperatively. At this time most of the wound strength is provided by the sutures and not by wound healing stressing the importance of the type of closure and its influence on wound dehiscence.

In a prospective study conducted by Diener MK, Voss S, Jensen K et al<sup>17</sup> (2010) they found that the introduction of mass closure technique reduced the incidence of burst abdomen from over 3% in 1995 to 0.95% in 2007. Following this large number of studies have confirmed the superiority of mass closure over the conventional layered closure. However some studies have found no difference between the uses of mass or layered closure ie., Riou et al<sup>3</sup> (1992), Irvin et al<sup>5</sup> (1977), Stone et al<sup>8</sup> (1983). Our Study has found that mass closure reduces the incidence of dehiscence when compared to layered closure. Perhaps more important that the choice of incisions or type of closure is the technique used in placing the sutures. Jenkins<sup>19</sup> has stressed the mechanical cause of the burst abdomen and has noted a significantly lower rate of dehiscence when sutures are placed wide enough so that the length of the suture is greater than four times that of the wound (Jenkins Law).

**Retention (Tension) sutures:**

Use of retention sutures has shown to decrease the incidence of wound dehiscence. The healing of the incision takes place formation of a dense fibrous scar that unites the opposing faces of the laparotomy wound en-mass. The purpose of retention sutures is to act as a splint while this dense fibrous scar deposits and matures and to co-apt the wound edges till they heal.

**CONCLUSION:**

The incidence was 7.2%. Peritonitis was the most common pathology. The significant factors were age more than 50, Wound infection, Type of closure. Tension Suture application has shown to reduce the incidence of wound dehiscence. Wound dehiscence carries a high morbidity and mortality, but with due care, it is a preventable complication.

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