INTRODUCTION
Wound dehiscence is parting of the layers of a surgical wound. Either the surface layers separate or the whole wound splits open. It presents as mechanical failure of wound healing of the surgical incision.\textsuperscript{1}

Post-operative wound dehiscence, being an unfortunate and a very serious surgical complication which is associated with a high morbidity and mortality rate despite the most sophisticated intensive care.\textsuperscript{1}

Laparotomy wound dehiscence is still a puzzle for most of the surgeons. No institute could achieve 0 % failure rate despite best efforts. However, most hospital globally have achieved and maintained failure rates well below 1 %. Therefore, there is continuing research to eliminate this complication.\textsuperscript{2} Historically, wound dehiscence up to 10% was reported, contemporary series estimates an incidence between 1 and 3%.\textsuperscript{3,4} Mortality associated with dehiscence has been estimated at 10-30%.\textsuperscript{5} The mean time for wound dehiscence is 8-10 days after operation.\textsuperscript{5,6}

Wound dehiscence, also known as burst abdomen or wound disruption, carries a substantial morbidity as well as mortality and in addition, there is an increase in the cost of care, both in terms of increased hospital stay, nursing, and workforce cost in managing cases of burst abdomen.\textsuperscript{1}

There are many studies in the literature comparing various methods of wound closure, with conflicting results. Unfortunately, the types of safe and effective abdominal closure vary, leaving the surgeons wondering which closure is superior.

Since there are conflicting results in literature, in the present study we have compared closure of midline abdominal wound by Continuous vs Interrupted X suture technique with polydioxanone No 1 (PDS) suture. No such study has been conducted in our institute in the past.

Aims and objective:
To compare the rate of abdominal wound dehiscence by using continuous Vs Interrupted X suture technique in closure of rectus sheath after midline laparotomies.
MATERIAL AND METHOD

Source of Data:
This study was conducted on 200 patients undergoing midline laparotomy in the Department of General Surgery, Indira Gandhi Medical College, Shimla from June 2018 to December 2019. Patients was selected who require midline laparotomy either as emergency or elective procedure.

Inclusion Criteria:
1. Patients aged 18-75 years, requiring laparotomy
2. Gender: Both male and female.
3. Patients who require surgery with midline incision either as emergency or elective procedure.
4. All patients given written informed consent for enrollment in study.

Exclusion Criteria:
1. Patients below 18 years and above 75 years.
2. Patients aged 18-75 years with immuno-compromised state, on chemotherapy/immunotherapy, long term steroids.
3. Patients who died within 10 days following midline laparotomy
4. Patients undergoing Re-Laparotomy.

Study Design:
It was a prospective randomized comparative study on 200 patients who were divided into two groups 100 each by sealed envelope method and they were randomized accordingly.

Group-A: Closed by suturing the rectus sheath using Polydioxanone suture 1-0 (PDS) in conventional continuous layer suturing technique.

Group-B: Closed by suturing the rectus sheath using Polydioxanone suture 1-0 (PDS) in interrupted X suture technique.

Method of Collection of Data:
Pre-Operative Evaluation:
Study procedure: Closure of midline abdominal wound by Continuous layer suturing technique with polydioxanone No 1 (PDS) suture.

Method of Collection of Data:
Pre-Operative Evaluation:
The patients were assessed preoperatively with clinical history, physical examination, biochemical and radiological evaluations. A detailed Performa was filled with the following details:
1. Details of patient age, sex, address, CR No., Date of Admission, Date of discharge.
2. Brief History
3. General Physical Examination
4. Details ofOperative Procedure
   a) Date of surgery
   b) Operation
   c) Indication
   d) Findings
   e) Closure Technique

Patients included in the study undergone following investigations:
1. Complete Haemogram: Haemoglobin (HB), Total Leucocyte Count (TLC), Differential Leucocyte count (DLC), Platelet Count.
2. LFT and Serum Proteins.
4. Serum Electrolytes: Sodium (Na+), Potassium (K+), Chloride (Cl-).
5. Chest X-Ray (PA View)
6. Abdomen X-Ray (AP View in Erect and Supine Position)
7. Ultrasound Abdomen/CT
8. Electrocardiography (ECG)

Intra-Operative Technique
After parts painted and draped, midline incision was given and abdomen was opened in layers. Once the pathology dealt, abdominal drains placed rectus sheath was closed either by continuous or interrupted X suture technique by PDS 1-0 RB as per group allocation. 34

Suture Material
PDS 1-0 Round body was used in both groups.

Technique of Continuous closure
Continuous Closure Technique: Continuous closure, performed using PDS 1-0 RB, care being taken to place each bite 1.5-2 cm from linea alba edge with successive bites being placed 1 cm from each other. The linea Alba was gently approximated without strangulation.

Interrupted X-Closure
Interrupted X-closure performed using PDS 1-0 RB as large bite being taken outside as 2 cm from the cut edge of linea alba. The needle emerged on other side from inside out diagonally 2 cm from the edge and 4 cm above or below the first bite. This strand subsequently crossed or looped around the free end of suture and continued outside in diagonally at 90o to the first diagonal. The two end tied just tight enough to approximate the edge of linea alba taking care not to include omentum or bowel between the edges. This created two X like crosses- one on the surface and another deep to linea alba. The next X- suture placed 1 cm away from the previous one. Henceforth, in a 14 cm long wound, 3 X-sutures was applied.

Post-Operative evaluation:
In post-operative period, patients examined daily, kept nil per oral and on par-enteral fluids till bowel recover and assessed for the following parameters:
1. Cough
2. Discharge
3. Abdominal Distension
4. Drain output
5. Wound Gaping
6. Wound Dehiscence
7. Anemia
Broad Spectrum antibiotic coverage was given and changed as per culture sensitivity of wound discharge. Daily dressing was done. In asymptomatic patients with no wound infection, gaping and wound dehiscence, skin sutures removed on 10th post-operative day.

**Follow up:** Regular follow up done up-to 7th, 10th and 14th day. During follow up above mentioned parameters assessed.

**Statistical Analysis**

The present study was carried out in a randomized prospective manner and statistical analysis of the data done at the end of the study using appropriate statistical tests depending upon the variables. Quantitative data was presented as mean and range as appropriate. For normally distributed data, mean was compared using T-test. For discrete categorical data, number and percentage were calculated. Chi-Square tests or Fisher’s exact tests were applied for categorical data. All statistical tests were two sided. A p value of <0.05 was considered to indicate statistical significance. Analysis was conducted using Epi-Info version 7.2.3.1.

**Observation and Result**

The study was conducted in the Department of General Surgery, Indira Gandhi Medical College and Hospital, Shimla, Himachal Pradesh from June 2018 to December 2019. A total of 200 patients were included in the study.

The patients were randomized into two groups, Group 1 and Group 2. The patients included in Group 1 underwent closure of rectus sheath with conventional continuous closure technique and patients included in Group 2 underwent closure of rectus sheath with interrupted X suture technique. A total of 100 patients were included in each group.

In current study the common indication of midline laparotomy was hollow viscus perforation and D1 perforation i.e perforated duodenal ulcer was the most common indication in both groups. (Table 1).

<table>
<thead>
<tr>
<th>Indications of Laparotomy</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1 Perforation</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Small Gut Perforation</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Perforated Appendix</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>BTA &amp; PTA</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Pre Pyloric Perforation</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Gastric Perforation</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>GB Perforation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ruptured Liver Abscess</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Iatrogenic Large Gut Perforation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ca Stomach Or Chronic DU</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Small Bowel Obstruction</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Growth Large Gut</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Gut Volvulus</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Incomplete Intestinal Obstruction</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Gangrenous Small Gut</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Small Bowel Growth</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Diaphragmatic Hernia With Umbilical Hernia</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 1: Indications of Laparotomy**

In this study there were 79% males and 21% females in Group -1 while there were 89% males and 11% females in Group 2. This data when analyzed by the Chi-Square test, gave a p value of 0.0537 which was not significant which means that both Groups were comparable with respect to the sex distribution of the patient. (Table-2) (Figure-1)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group 1</th>
<th>Group 2</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>79%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>21%</td>
<td>11%</td>
</tr>
<tr>
<td>Age</td>
<td>Mean age</td>
<td>47.08± 15.81</td>
<td>45.65± 14.93</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>Yes</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>68</td>
<td>94</td>
</tr>
</tbody>
</table>

**Table 2: Age & Gender distribution of Study Participants**
In group 1, age of the patients varied from 18–75 years with a mean age 47.08 years and SD ± 15.81. In group 2, age of the patients varied from 18-75 years with a mean age of 45.65 years and SD ± 14.93. On analysis by the student T-test, it shown that the age variation between the two groups was statistically insignificant with a p value of 0.51. Thus both the groups were comparable with respect to the age distribution of the patients. (Table-2)

In Group 1, out of 100 patients wound dehiscence occurred in 32 cases while in Group 2, out of 100 patients wound dehiscence occurred in 6 cases. The difference of wound dehiscence in two groups was statistically significant. (Table-2)(Figure-2)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Wound dehiscence</th>
<th>Percent</th>
<th>Wound dehiscence</th>
<th>Percent</th>
<th>Wound dehiscence</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-25</td>
<td>2</td>
<td>6.25</td>
<td>0</td>
<td>0.00</td>
<td>2</td>
<td>5.26</td>
</tr>
<tr>
<td>26-35</td>
<td>3</td>
<td>9.36</td>
<td>1</td>
<td>16.67</td>
<td>4</td>
<td>10.53</td>
</tr>
<tr>
<td>36-45</td>
<td>7</td>
<td>21.88</td>
<td>2</td>
<td>33.33</td>
<td>9</td>
<td>23.68</td>
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<tr>
<td>46-55</td>
<td>6</td>
<td>18.75</td>
<td>2</td>
<td>33.33</td>
<td>8</td>
<td>21.05</td>
</tr>
<tr>
<td>56-65</td>
<td>9</td>
<td>28.13</td>
<td>1</td>
<td>16.67</td>
<td>10</td>
<td>26.32</td>
</tr>
<tr>
<td>66-75</td>
<td>5</td>
<td>15.63</td>
<td>0</td>
<td>0.00</td>
<td>5</td>
<td>13.16</td>
</tr>
</tbody>
</table>

Table-3: Age Group distribution of Wound dehiscence
**DISCUSSION**

The present study was performed at Indira Gandhi Medical College & Hospital, Shimla, HP, to compare the rate of abdominal wound dehiscence in continuous versus interrupted X suture technique for abdominal wall closure in midline laparotomy.

In the present study, mean age was 47.08 years and SD ± 15.81 in group 1 while in group 2, mean age was of 45.65 years and SD ± 14.93, did not show any significant difference (p=0.51) between the two groups and both age groups were comparable.

In this study there were 79% males and 21% females in Group -1 while there were 89% males and 11% females in Group 2. This data when analyzed by the Chi-Square test, gave a p value of 0.0537 which was not significant which means that both Groups were comparable with respect to the sex distribution of the patient.

In current study 200 patients enrolled and all underwent midline laparotomy and a total of 38 (19%) patients had wound dehiscence, out of which 32% (32 out of 100) patients in conventional continuous suture group developed wound dehiscence, while 6% (6 out of 100) patients in the interrupted X suture group developed wound dehiscence. The difference of wound dehiscence in two groups was statistically significant.

In 2017, Kuldip Singh Ahi et al conducted a prospective randomized study of conventional continuous versus Interrupted-X type versus Hughes Far and Near interrupted abdominal fascial closure in surgical patients to prevent burst abdomen. They took 90 patients, 19 (21%) of 90 patients develop burst in the post-operative period. 11 (36.7%) of 30 patients in continuous arm developed burst, 4 out of 30 (13.3%) patient in Interrupted-X arm and 4 out of 30 (13.3%) patients in Hughes Far and Near arm developed burst abdomen. On statistical analysis it is found significant (p=0.011) and the results obtained in the current study were comparable to this study.

In 2018, Shashikala V et al conducted a prospective comparative study between continuous and X interrupted suture in emergency laparotomies. A total of 60 patients undergoing emergency midline laparotomy for secondary peritonitis were considered for the study, 30 of whom underwent closure of abdominal wall with continuous sutures and the other 30 with X-interupted suture. The wound dehiscence rate was 26.67% (8 out of 30) for continuous group versus 6.67% (2 out of 30) for the interrupted group. This difference was statistically significant showing results similar to those obtained in the current study.

Most of wound dehiscence in current study occurred from 5th to 10th post-operative day. This duration is within the period as quoted by similar studies. Anielski et al reported average time of wound dehiscence is 6.5 days and Madsen et al reported the sixth post-operative day. Wound dehiscence occurring within 3-4 days is due to technical failure. Wound dehiscence occurring after 11th day is due to either surgical site infection or removal of sutures. Further it is observed that with increase in age there is more chance of wound dehiscence as compare to young age group.

**CONCLUSION**

The present study reported high incidence of wound dehiscence after using Continuous Suture Technique in Midline Laparotomy as compared to Interrupted X Suture Technique. Patients with age group of 56-65 years found to have highest incidence of abdominal wound dehiscence. Most of wound dehiscence occurred from 5th to 10th post-operative...
day. Wound dehiscence rate is more in emergency midline laparotomies as compared to elective cases. Hence, Using interrupted X suture technique in sheath closure, the risk of wound dehiscence can be reduced up to quite an extent.

REFERENCES