

## Original Research Article

# Experience of small tissue bites with conventional tissue bites in emergency setting for midline abdominal wound closure

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## ABSTRACT

**Background:** Midline incision provides excellent access to the abdominal cavity. However, wound infection following a laparotomy can increase morbidity as well as burden on health care system. Wound prognosis can be influenced by the type of incisions, suture material and the method of closure. This study aimed to assess the outcome of midline abdominal wound closure using two different techniques of wound closure.

**Methods:** This was a prospective observational study and consisted of 300 consecutive patients  $\geq 18$  years of age undergoing abdominal surgery through a midline incision in emergency setting. Patients who were included in the study were then randomised into two groups. In group I, midline laparotomy was closed with large tissue bites and in group II small tissue bites were used.

**Results:** Out of 300 patients included in this study, 150 patients were subjected to large tissue bites and another 150 patients to small tissue bites. 29 patients out of 150 patients (19%) in large tissue bites group and 16 patients (11%) in small tissue bites developed surgical site infection (SSI). 23 patients out of 150 patients (15%) in large tissue bites group and 11 patients (7%) in small tissue bites developed wound dehiscence.

**Conclusions:** In this study, we found that the patients in group II whose midline laparotomy was closed with small tissue bites had better wound outcome postoperatively in terms of wound site infection and wound dehiscence.

**Keywords:** Surgical site infection, Wound dehiscence, Laparotomy closure

## INTRODUCTION

Several types of incisions for abdominal surgeries have been mentioned in surgical literature out of which, the most common being the midline incision. Midline incision provides for an easy and effective way to access the abdominal cavity. As it can be rapidly performed, it is ideal incision in emergency settings to take care of all the quadrants of abdomen. The incision can not only be made quickly taking on an average five to seven minutes but also can be closed quickly.<sup>1-4</sup> Also there are less chances of damage to nerves, muscles and the vascular supply of the abdominal wall. There are however various

complications that can occur after a laparotomy which are directly attributable to the incision which include SSI, wound dehiscence (WD), evisceration, stitch abscess and incisional hernia.<sup>5</sup> Surgical intervention in itself is an expensive affair and wound complications due to laparotomy further increases the burden not only on the family but also on the health care system.<sup>6</sup> SSI can occur after a laparotomy especially in emergency setting. It may further lead to WD which can further cause incisional hernia after few months or sometimes years leading to more morbidity and burden on health care system. Dehiscence is a sequel of wound infection usually occurring 7 to 10 days postoperatively but on rare

occasions may occur even after 20 days postoperatively.<sup>7</sup> There are various factors responsible for dehiscence. These can be categorised under two groups: patient factors and surgical factors. The patient factors are usually not under control or partially under control and include age, sex, body mass index, local or generalised sepsis, low hemoglobin, chronic illness, malignancy, vitamin deficiencies and intra-abdominal hypertension. The most important vitamin responsible include vitamin C. The other type of factors are known as surgical factors. These are those factors can be moderated by surgeon to have a better prognosis as far as the wound is concerned. These include the type of incisions, suture material and the method of closure. These factors if taken care of by surgeon can help to minimize wound complications.<sup>8</sup> Closure of wound is an very intricate affair and several guidelines have been put forward from time to time in this regard. One of the guidelines of particular importance is that given by Jenkin. Jenkin after many clinical trials and mathematical workings, gave a ratio between the suture length and wound length during the closure of a midline incision. He approximated this ratio as 4. He postulated that if this ratio of suture length to wound length was less than 4, the chances of wound site complications were three times.<sup>9-11</sup> This ratio can be achieved by an appropriate size of each stitch and appropriate stitch interval. In easy words, in order to reduce chances of wound infection, either many small stitches needs to be placed at close intervals or a larger amount of tissue needs to be incorporated into stitches placed at greater intervals. This can help to achieve a ratio of at least 4 and thus lessen chances of wound infection.<sup>12</sup>

### **Aims and objectives**

This study aimed to assess the outcome of midline abdominal wound closure using two different techniques of wound closure. This included the conventional one where we used bigger tissue bites to close the laparotomy and the one where we used smaller tissue bites to close the laparotomy.

### **METHODS**

This was a prospective observational study which was conducted in the department of general surgery GMC Jammu. The study period was from January 2018 to December 2020. Those patients who underwent laparotomy in emergency settings via midline incision were included in this study. As it was an observational study, ethical clearance was not required in this study. Our study consisted of 300 consecutive patients undergoing abdominal surgery through a midline incision. All patients  $\geq 18$  years of age were included in this study who underwent midline laparotomy in the emergency settings only.

The following patients were excluded from the study: patients who were operated in elective settings; patients

with a history of previous abdominal surgery; patients having anaemia, diabetes, hypoproteinemia or any chronic illness affecting the wound healing.

All the baseline investigations were done in all the patients who were being subjected to midline laparotomy. These included hemogram, blood counts, kidney function test, liver function tests and coagulogram. Patients who were included in the study were then randomised into two groups: I and II. Group I and group II each had 150 patients. In group I, midline laparotomy was closed with conventional technique using large tissue bites which were being placed at least 1 cm from the wound edge and each being 1 cm apart and in group II small tissue bites were used placed 0.5 cm from the wound edge and 0.5 cm apart and included only the aponeurosis in the stitches without peritoneum. Polydioxanone (PDS) suture No.1 on round body needle was used in both the groups to close the abdomen. We performed continuous sutures in all our patients. Patients were followed up for a period of one year to gather information regarding any wound related complications. The statistics was done using Chi square chart (SPSS software version 2.0).

### **RESULTS**

This was a prospective observational study which was conducted in the department of general surgery GMC Jammu over a period of three years. The study period was from January 2018 to December 2020. The study population consisted of 300 consecutive patients, who fulfilled the inclusion criteria and undergoing midline laparotomy. The following observations were made.

#### **Age and sex**

In our study of 300 patients, the youngest patient was an 18 year old male while the eldest was an 84 years male. Mean age in group I where conventional technique was used and large tissue bites were taken was 49.48 years with standard deviation of 17.67 and the mean age in group II where small tissue bites were taken was 48.24 years with standard deviation of 17.46. The p value was  $>1$  when we compared the age distribution between the two groups as shown in Table 1.

**Table 1: Age and sex distribution.**

Age (in years)	Group I	Group II	Total
18-27	18	12	30
28-37	22	19	41
38-47	25	33	58
48-57	41	33	74
58-67	20	26	46
68-77	15	17	32
>77	09	10	19
<b>Total</b>	150	150	300

Thus we can infer that the age between the two groups was comparable. Also out of 300 patients, about 69.33%

(208) were males while 30.66% (92) were females giving a ratio of 3:1.

### Serum albumin

In group I and group II, mean albumin levels were 3.1 with standard deviation of 0.87 and 3.27 with standard deviation of 0.64 respectively (Table 2). The p value was >1.0 providing no statistical difference in albumin levels between patients in two groups.

**Table 2: Serum albumin.**

Serum albumin	Group I	Group II
<3.0	81	88
>3.0	69	62
<b>Total</b>	<b>150</b>	<b>150</b>

### Ratio of suture length to wound length

In group I, mean suture length (SL) to wound length (WL) ratio was 4.84 and in group II, it was 5.18. The p value of the ratio of suture to wound length in two groups was <0.05 which is statistically significant (Table 3).

**Table 3: Ratio of mean SL to WL.**

SL:WL	Group I	Group II
4:1-5:1	85	71
5:1-6:1	65	79
<b>Total</b>	<b>150</b>	<b>150</b>

### SSIs

SSI developed in 29 patients in group I while there were 16 patients in group II who developed SSI. When the two groups were compared and the p value was calculated, it was found to be 0.035 which was statistically significant (Table 4).

**Table 4: Incidence of SSIs.**

SSIs	Group I	Group II
Present	29	16
Absent	121	134
<b>Total</b>	<b>150</b>	<b>150</b>

### WD

There were 23 patients in group I and 11 patients in group II who developed WD. The p value on comparison of two groups came out to be 0.003 which was again statistically significant (Table 5).

**Table 5: Incidence of WD.**

WD	Group I	Group II
Present	23	11
Absent	127	139
<b>Total</b>	<b>150</b>	<b>150</b>

## DISCUSSION

In order to avoid any postoperative surgical site complications, surgical technique plays a very crucial role. Abdomen closure technique was affected by many variables and from time to time, it had been based on recommendations from various teachers or researchers. Personal experience also affected how a surgeon choose to close a laparotomy. In 1970, Dudley promoted that for a safe abdominal closure, large tissue bites to be taken and thick sutures to be used.<sup>13</sup> Jenkins as previously described in the above text, recommend a specific SL:WL ratio that he calculated through various mathematical calculations and clinical studies.<sup>11</sup> In this study we aimed to compare the outcome of midline abdominal wound closure after using small tissue bites versus large tissue bites with reference to surgical site infection and WD.

### Age distribution

Mean age in group I where large tissue bites were taken was 49.48 years with standard deviation of 17.67 and the mean age in group II where small tissue bites were taken was 48.24 years with standard deviation of 17.46. The p value was >1 when we compared the age distribution between the two groups as shown in Table 1. Thus we can infer that the age between the two groups was comparable. There have been several such studies in past. One among these was done by Israellson et al from 1993 to 1996, in which the difference between the mean age of their long stitch length group (64 years) and short stitch length group (65 years) was statistically insignificant (p=0.30).<sup>11</sup> In our study, the mean age was less than the study done by Israelsson et al due to more number of cases in our young population.<sup>11</sup> Ours was a developing nation which had more peptic and duodenal perforation cases especially in young age group secondary to Helicobacter pylori infestation. Also there were more cases of road traffic accidents in our young population due to increased incidences of drink and drive.

### Serum albumin

In group I and group II, mean albumin levels were 3.2 with standard deviation of 0.95 and 3.30 with standard deviation of 0.77 respectively. The p value was >1.0 providing no statistical difference in albumin levels between patients in two groups.

There were 20 patients, out of 29 patients developing SSI in group I, who had albumin level less than 3 and 14 patients, out of the 16 patients developing SSI in group II, who had albumin level of less than 3. In Indian population, we found a lot more people suffering from nutritional deficiencies due to lower standard of living, which led to lower albumin levels. Similar results were demonstrated by Khan et al in their study, which had 28% of patients with WD having albumin less than 3.5 g/dl.<sup>14</sup>

### Ratio of SL to WL

In group I, mean suture length to wound length ratio was 4.84 and in group II, it was 5.18. The p value of the ratio of suture to wound length in two groups was <0.05 which was statistically significant (Table 3). In both the groups, a SL to WL ratio was always greater than 4. However no case required a suture length more than 6 times the wound length. In a similar study done by Subodh et al in 1999, 100 consecutive patients undergoing elective or emergency laparotomy through a midline incision were entered into their prospective study.<sup>15</sup> They found that the mean SL to WL ratio was 6.2:1. They recommended that an optimal suture length to wound length ratio greater than or equivalent to 6:1 to achieve safe closure of midline laparotomy incision.

### SSI

SSI developed in 29 patients in group I while there were 16 patients in group II who developed SSI. When the two groups were compared and the p value was calculated, it was found to be 0.035 which was statistically significant (Table 4). Most of the patients who developed SSI in our study had undergone emergency surgery secondary to generalized peritonitis. In a study done by Milbourn et al 10.2% patients in long stitch length group and 5.2% patients in short stitch length group had surgical site infection.<sup>12</sup>

### WD

There were 23 patients in group I and 11 patients in group II who developed WD. The p value on comparison of two groups came out to be 0.003 which was again statistically significant (Table 5). In a study done by Harlaa et al in 2009 compared the large and small-stitch techniques on tensile strength and type of dehiscence in a controlled laboratory setting by using porcine abdominal walls.<sup>16</sup> In their study, they observed that small stitches with small suture distances achieved higher tensile forces than large stitches with large suture distances. Therefore, they concluded that small stitches may be useful to prevent the development of a burst abdomen or an incisional hernia after midline incisions.

### Limitation

This study was limited by the small sample size. Another limitation of this study was that it involved more than one surgeon. There was a need to have large trials to confirm these findings.

### CONCLUSION

This was a prospective observational study which was conducted in the department of general surgery GMC Jammu over a period of three years which consisted of 300 consecutive patients undergoing midline laparotomy. In this study, we found that the patients in group II whose

midline laparotomy was closed with small tissue bites had better wound outcome postoperatively in terms of wound site infection and wound dehiscence when compared to those who were closed using large tissue bites.

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