

A Prospective Comparative Study to Determine the of Midline Abdominal Wound Closure Using two Different Techniques of Wound Closure

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Conflict of interest: Nil

Abstract

Aim: To assess the outcome of midline abdominal wound closure using two different techniques of wound closure.

Material & Method: This was a prospective observational study which was conducted in the department of general surgery Shree Narayan Medical Institute & Hospital, Saharsa, Bihar, India. All patients more than 18 years of age were included in this study who underwent midline laparotomy in the emergency settings only.

Results: In group I, mean suture length (SL) to wound length (WL) ratio was 4.74 and in group II, it was 5.16. The p value of the ratio of suture to wound length in two groups was <0.05 which is statistically significant SSI developed in 27 patients in group I while there were 19 patients in group II who developed SSI. When the two groups were compared and the p value was calculated, it was found to be 0.030 which was statistically significant.

Conclusion: 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

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Introduction

Midline incision is the most common incision performed in emergency setting as it gives excellent exposure to all the quadrant of abdomen. Midline incisions have advantage of rapid and wide access to the abdominal cavity with minimal damage to muscles, nerves and the vascular supply of the abdominal wall. The incision can be made quickly taking seven minutes on an average [1].

The complications after laparotomy include surgical site infection, stitch abscess, incisional hernia, wound dehiscence, and evisceration [2]; however, wound complications after any laparotomy increases burden on resources of the health care system [3].

The incision can not only be made quickly taking on an average five to seven minutes but also can be closed quickly.[4-7]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.[8]

Wound infection and wound dehiscence after laparotomy are likely to be followed by incisional hernia within months or perhaps a few years. Dehiscence most often develops 7 to 10 days postoperatively but may occur any time after surgery from 1 to more than 20 days [9]. The factors responsible can be categorized into two groups: patient factors and surgical factors. The patient factors include age, body mass index, chronic illness, cancer, infection, anemia, scurvy, and increased intra-abdominal pressure. Usually, it is not possible to control these factors. The factors which can be controlled are surgical factors which include the type of incisions, suture material, and the method of closure. It is in this area that the surgeon must concentrate his efforts to minimize wound complications [10].

Closure of wound is a 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.[11, 12] This study aims to assess the outcome of midline abdominal wound closure using two different techniques of wound closure.

Material & Method:

This was a prospective observational study which was conducted in the department of general surgery Shree Narayan Medical Institute & Hospital, Saharsa, Bihar, India. The study period of one year and those patients who underwent laparotomy in emergency settings via midline incision were included in this study.

Inclusion and exclusion criteria

All patients more than 18 years of age were included in this study that 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. A total of 400 patients were included in this study. Patients who were included in the study were then randomised into two groups: I and II. Group I and group II each had 200 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.

Statistical analysis

The statistics was done using Chi square chart (SPSS software version 2.0).

Results:

Mean age in group I where conventional technique was used and large tissue bites were taken was 48.31 years with standard deviation of 18.02 and the mean age in group II where small tissue bites were taken was 47.92 years with standard deviation of 18.29. The p value was >1 when we compared the age distribution between the two groups as shown in Table 1.

In group I and group II, mean albumin levels were 3.2 with standard deviation of 0.80 and 4.66 with standard deviation of 0.60 respectively (Table 2). The p value was >1.0 providing no statistical difference in albumin levels between patients in two groups.

In group I, mean suture length (SL) to wound length (WL) ratio was 4.74 and in group II, it was 5.16. The p value of the ratio of suture to wound length in two groups was <0.05 which is statistically significant (Table 3).

SSI developed in 27 patients in group I while there were 19 patients in group II who developed SSI. When the two groups were compared and the p value was calculated, it was found to be 0.030 which was statistically significant (Table 4).

There were 25 patients in group I and 15 patients in group II who developed WD. The p value on comparison of two groups came out to be 0.001 which was again statistically significant (Table 5).

Table 1: Age and sex distribution

Age (in years)	Group I	Group II	Total
18-27	20	15	35
28-37	33	28	61
38-47	35	42	77
48-57	59	49	108
58-67	24	31	55
68-77	21	23	44
>77	8	12	20
Total	200	200	400

Table 2: Serum albumin

Serum albumin	Group I	Group II
<3.0	117	122
>3.0	83	78
Total	200	200

Table 3: Ratio of mean SL to WL

SL:WL	Group I	Group II
4:1-5:1	128	120
5:1-6:1	72	80
Total	200	200

Table 4: Incidence of SSIs.

SSIs	Group I	Group II
Present	27	19
Absent	173	181
Total	200	200

Table 5: Incidence of WD.

WD	Group I	Group II
Present	25	15
Absent	175	185
Total	200	200

Discussion:

Implementation of the small bites suturing technique in our clinical practice was correlated with a significant reduction in SSI. In experimental studies [13, 14], large bites were found to compress or cut through soft tissue in the stitch, resulting in an increased amount of devitalized and necrotic tissue in the wound and might, therefore, explain the higher incidence of SSI in the group of patients in whom the large bites technique was used.

There have been several such studies in past. One among these was done by Israelson 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 ($p=0.30$).[15]

Several studies have indeed shown that the small bites suture technique results in a reduction of IVH [16, 17]. Although a 50% reduction in IVH was observed, this observation did not reach statistical significance. A possible explanation might be the relatively small sample size of our study since the power calculations in the randomized controlled trial estimated a sample size of 259 evaluable patients in both groups to reduce the mean incidence of incisional hernia by 50% [18].

A recent study by Tolstrup et al. showing a reduced dehiscence rate using the small bites technique in an emergency laparotomy setting [19]. In study done by Milbourn et al., [12] in long stitch length group, mean suture length to wound length ratio was 6.4 whereas in short stitch length group, suture length to wound length ratio

was 5.7. This difference was significant statistically (P value 0.001).[20]

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.[20,21]

Conclusion:

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.

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