



A STUDY COMPARING CONTINUOUS AND X-INTERRUPTED SUTURES AMONG EMERGENCY MIDLINE LAPAROTOMY AT DARBHANGA MEDICAL COLLEGE & HOSPITAL, BIHAR

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ABSTRACT

Midline laparotomy is the most common technique of abdominal incisions in both emergency and elective settings because it is simple, provides adequate exposure to all four quadrants, affords quick exposure with minimal blood loss. **Methodology:** This prospective randomized trial was conducted in the Department of General Surgery of Darbhanga Medical College and Hospital, Bihar between April 2019 to March 2021. The initial one year was period of data collection and next one year was used for follow up period, analysis and report writing. Ethical approval from the Institutional Ethics Committee was obtained prior to the commencement of the study and data collection. **Results:** Overall, the mean age of patients was 42.3 ± 9.7 years and the patients ranged from 21 years to 66 years. Mean age of patient in Group A was 44.1 ± 11.8 years and mean age of patient in Group B was 42.5 ± 12.2 years. Majority of patients in both groups were males, group A comprised of 78% males and group B 69%. Most common diagnosis for secondary peritonitis was duodenal ulcer perforation, followed by gastric ulcer perforation. **Conclusion:** Interrupted -X suture method of suturing is better than the conventional continuous method in the management of closure of emergency vertical midline laparotomy incision as the post-operative complications like wound dehiscence is found to be significantly lesser with the use of interrupted method of closure.

KEYWORDS : X-interrupted sutures, Emergency midline laparotomy

INTRODUCTION

Midline laparotomy is the most common technique of abdominal incisions in both emergency and elective settings because it is simple, provides adequate exposure to all four quadrants, affords quick exposure with minimal blood loss [1]. One of the most common and major complication associated with the closure of median laparotomy is wound dehiscence which is a major cause of postoperative morbidity. Wound dehiscence is related to several factors pertaining to patient besides suture material and method of closure [2]. Minimization of tissue damage is essential, and this may be done by avoiding inclusion of the abdominal wall musculature in the closure. A 4:1 ratio of suture bites versus suture advancement has been advocated [3]. Mass closure of abdominal wall is preferred over layered closure [4]. Use of non-absorbable sutures for abdominal closure (e.g., polypropylene) has been associated with increased pain and sinus track formation and has not shown any significant difference in the incidence of incisional hernia formation, wound dehiscence, or surgical site infection as compared with slowly absorbing monofilament suture, such as polydioxanone [5, 6].

The type of closure may not be so important in elective patients who are nutritionally adequate, do not have risk factors for dehiscence and are well prepared for surgery. However, it may prove crucial in emergency patients with peritonitis who often have multiple risk factors for developing dehiscence [7]. Closure of skin has always been debated in dirty or clean contaminated wounds, but it has been proven beyond doubt that leaving skin open in presence of contamination reduces the chances of wound sepsis as primary closure of skin in such circumstances creates an infected closed space and invariably leads to abscess formation and attendant sequelae [7-9].

Therefore, it is logical to exclude this factor when comparing the two methods of closure. This study tries to evaluate prospectively the continuous sutures with interrupted x-type sutures in mass closure of midline laparotomy wound with non-absorbable monofilament suture polypropylene in patients undergoing emergency midline laparotomy for acute peritonitis and its effectiveness in preventing burst abdomen in our hospital.

METHODOLOGY

2.1 Selection of study participants

This prospective randomized trial was conducted in the Department of General Surgery of Darbhanga Medical College and Hospital, Bihar between April 2019 to March 2021. The initial one year was period of data collection and next one year was used for follow up period, analysis and report writing. Ethical approval from the Institutional Ethics Committee was obtained prior to the commencement of the study and data collection. The study population comprised of patients attending the emergency department with perforative peritonitis and in need of emergency laparotomy. Exclusion criteria included patients younger than 18 years, who have undergone previous laparotomies for any condition, or those with incisional hernia or burst abdomen at presentation. Informed consent consents were obtained from each patient before including him/her in the study. The study included 100 such patients, who were divided equally and randomly into two groups:

- Group A: 50 patients who underwent continuous closure of abdominal wall using non absorbable (polypropylene) suture.
- Group B: 50 patients who underwent X- interrupted suturing of abdominal wall using non absorbable (polypropylene) suture.

Preoperative investigations essential for the preanesthetic evaluation and fitness for surgery. These included complete blood count, serum electrolytes, blood sugar, blood urea and serum creatinine, total bilirubin, alkaline phosphatase, SGOT/SGPT, total proteins with serum albumin, x-ray erect abdomen, Chest x-ray Electrocardiogram and body mass index.

2.2 Operative procedure

All patients were given pre-operative dose of antibiotics according to hospital antibiotic policy which were continued in the post-operative period also. Exploratory laparotomy was carried out through a midline vertical incision. The length of the incision was measured using a sterilized metallic scale. Necessary procedure was carried out according to the intra-operative findings. Peritoneal cavity was washed thoroughly with warm normal saline till the effluent was clear. Variable number of peritoneal drains were inserted as required. The required closure was performed accordingly. The time taken

for closure was noted. The total length of the suture material used was noted. Suture length: wound length ratio was subsequently computed. The skin was left unsutured in all the cases. The wound was primarily dressed with sterile surgical gauzes and covered with occlusive adherent bandage. The primary dressing was removed after 48 hours and daily dressing was done. The wounds were inspected for signs of infection and dehiscence before each dressing. Swab cultures from the wound were sent for microbiological culture and antibiotic sensitivity on evidence of any signs of infection. Wounds were closed secondarily if there were no signs of infection or dehiscence and healthy granulation tissue appeared.

2.3 Methods of closure

The randomization of the patients was done with computer generated random tables which was informed intraoperatively by a nursing attendant. Written informed consent was taken from all the patients. Patients were subsequently divided into the following two groups for closure:

- Group A (continuous non-absorbable) Non-absorbable No.1 polypropylene was used in a simple running technique starting just proximal to the incision. The bites were taken 1-2cm from the divided edge with a distance of 1cm between the two consecutive bites in a non-interlocking manner.
- Group B (X- interrupted non-absorbable) It was performed using No. 1 polypropylene suture. A large bite was taken on the cut edge of linea alba from outside-in, 2 cm from edge. The needle emerged on the other side from inside-out diagonally 2 cm from the edge and 4 cm above or below the first bite. This strand was crossed or looped around the free end of suture and continued outside-in, diagonally at 90° to the first diagonal. The two ends were tied just tight enough to approximate the edges of linea alba taking care not to include bowel or greater omentum between the edges. The small free end of the suture was passed deep to the X behind linea alba and again tied to the other end of the suture. This method of tying four throws in front and four throws behind the X created two X-like crosses one on the surface and another deep to linea alba. The central knot allowed fixation of four arms of the X like a pivot. The next X-suture was placed 1 cm a way (above or below) from the previous one. Thus, in a 14 cm long wound, 3 X-sutures were applied. The suture line was then palpated for any gap with the index finger. Any large gap permitting a finger was closed with a simple interrupted suture.

2.4 Follow up and statistical analysis

Follow up Patients were followed up and re-evaluated at 2, 4, 6 and 12 weeks after surgery in outpatient department. The patients were examined for wound infections or dehiscence. Statistical analysis Descriptive statistics have been applied. Various case observations are documented on MS office Excel Spreadsheets. Necessary analysis of data for the purpose of the study has been carried out on SPSS 20.0 software in pursuance of the objectives of the study, to test the difference of significance between the two groups, independent t test has been applied and the level of confidence chosen is 0.05. For categorical data chi-square test has been used.

RESULTS

3.1 Pre - operative findings [Table 1]

Demographic details

Overall, the mean age of patients was 42.3 ± 9.7 years and the patients ranged from 21 years to 66 years. Mean age of patient in Group A was 44.1 ± 11.8 years and mean age of patient in Group B was 42.5 ± 12.2 years. Majority of patients in both groups were males, group A comprised of 78% males and group B 69%.

Underlying cause

Most common diagnosis for secondary peritonitis was duodenal ulcer perforation, followed by gastric ulcer perforation.

Table 1: Table showing distribution of study participants according to their underlying cause for perforative peritonitis

Type of perforation leading to perforative peritonitis	Group A	Group B	Total
Duodenal perforation	47	46	93 (46.5%)
Gastric perforation	27	28	55 (27.5%)
Ileal perforation	15	15	30 (15.0%)
Caecal perforation	12	10	22 (11.0%)

3.2 Intraoperative findings

Time taken for closure of rectus sheath

The mean time taken for closure of rectus sheath in Group A was found to be 12.8 ± 3.2 minutes and it was significantly less ($p > 0.05$) than patients of group B who were given x interrupted sutures.

Suture length

Mean suture length used in Group A was 72.7 ± 12.3 cm which was significantly less ($p < 0.05$) as compared to group B where $112.9.1 \pm 17.12$ cm of suture material was required.

Ratio of Suture length to wound length (SL:WL)

SL: WL was calculated by dividing the length of the suture used in closing the rectus sheath and then dividing it by total incision length individual patient and then calculating the mean. The mean SL: WL for Group A was 5.1 and for group B was 7.2.

3.3 Post - operative findings

Wound infection

Surgical site infection was noted and recorded in only 12 out of 100 patients (12%) of group A and 19 out of 100 patients (19%) of group B. There was not statistically significance in terms of surgical site infection ($p > 0.05$) in both the groups. Maximum wound infection rate was present at the end of two weeks. No wound infection persisted till 12 weeks, that is after discharge from the hospital.

Wound dehiscence

Wound dehiscence was noted and recorded in both the groups in the immediate post-operative period till the time of discharge. Overall, wound dehiscence occurred in 16.67 % patients. In group A, 35 out of 100 (35%) patients developed wound dehiscence and in group B, 8 out of 100 patients (8%) developed wound dehiscence. Patients with rectus sheath sutured in x-interrupted sutures had significantly less (p value < 0.05) wound dehiscence as compared with continuous sutures.

DISCUSSION

The best method of abdominal closure is one that maintains tensile strength throughout the healing process with good tissue approximation, does not promote wound infection or inflammation, is well tolerated by patients and is technically simple and expedient. The specific technique used in closure of the abdominal fascia for the individual is frequently based on nonscientific factors. Because of difficulties arising from differently tailored study designs, the surgical literature has not clearly demonstrated an optimal technique to close abdominal fascia, especially in emergency settings.

Mean time taken for closure of rectus sheath in group A was 12.8 ± 3.2 minutes, and that for group B was 32.8 ± 5.4 . Mean time taken for closure in continuous technique was less as compared to x - interrupted group, the difference being statistically highly significant ($p < 0.05$). This may be attributed to continuous suturing that minimizes the time of doing multiple knots.

Mean suture length used in closing rectus sheath in group A was 72.7 ± 12.3 , and that in group B was $112.9.1 \pm 17.12$ cm. Mean suture length used in continuous suturing was less compared to x-interrupted suturing, the difference being statistically significant ($p < 0.05$). Since difference in suture length can be present depending upon the length of the incision, it was standardized in each group and each group was comparable with regards to incision length. SL:WL was, therefore, considered a more standard parameter to evaluate and compare the amount of suture material used in either technique. Mean SL:WL for continuous and x-interrupted groups as computed was 5.1 and 7.2, the difference being statistically significant.

Jenkins was the first one to define an ideal ratio of 4:1 for closure of laparotomy wounds based on clinical trials and mathematical model [9]. This fact has been since then validated by many studies and meta-analysis. Although there has been no randomized trial looking at SL: WL ratio, Kendall et al had a SL: WL ratio of 3.7:1 in layered closure and 5:1 in the mass closure group [10]. Despite this there was no difference in incisional hernia rates at one-year follow-up and suggests that SL: WL may not be critical as suggested by Israelsson and Jonsson and other similar studies [11-13].

Wound infection rate in the group A was 12% and that in group B was 19%. The total wound infection rate was 31%. Wound infection rate in continuous group was more as compared to x-interrupted group but was not statistically significant. No statistically significant difference was observed in the wound infection rate between the continuous and interrupted closure in similar studies published elsewhere [14, 15].

Wound dehiscence was noted in 43% of the patients. It was present in 35% in group A and 8% in group B. This difference was statistically significant. Indian authors have reported burst abdomen to occur in 10-30% of emergency cases. High percentage of wound dehiscence could be attributed to higher wound infection rate and malnourishment. Kumar et al in a prospective study of 100 patients concluded that the interrupted x suture technique is better than continuous suture technique in prevention of burst abdomen in both emergency as well as elective mid line laparotomy, with the burst abdomen rate of 2% in interrupted X suture as compared to 12% burst abdomen in continuous suture technique [16].

CONCLUSION

X-interrupted method of suturing also requires significantly more suture material than the conventional continuous method. Interrupted -X suture method of suturing is better than the conventional continuous method in the management of closure of emergency vertical midline laparotomy incision as the post-operative complications like wound dehiscence is found to be significantly lesser with the use of interrupted method of closure.

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