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# RECTUS SHEATH CLOSURE TECHNIQUES IN EXPLORATORY LAPAROTOMY : CONTINUOUS VERSUS INTERRUPTED SUTURING: A PROSPECTIVE STUDY

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## Abstract

**Background:** One major surgical operation is exploratory laparotomy. The most popular method for opening the abdomen is midline laparotomy because it is easy to do, offers sufficient exposure to all four quadrants, and allows for rapid exposure with little blood loss. Numerous techniques have been used to close laparotomy wounds, including absorbable versus non-absorbable sutures, single layer versus mass closure, and continuous versus interrupted closure.**Aims and Objectives:** The aim of the study was to find out the technique of rectus sheath closure in patients undergoing exploratory laparotomy that can reduce the burden of complications in post-operative period. **Materials and Methods:** It is a hospital-based prospective randomized observational study which was conducted in a tertiary care hospital and medical college with a time frame of about years. A total number of 74 patients of adult age group (01–70 yrs) admitted in general surgery ward of (medical college name add)undergoing exploratory laparotomy. **Results:** 30 (50%) patients of midline laparotomy were closed in continuous technique. Rest 30 (50%) patients were closed in interrupted technique. The hospital stay was similar in both groups. There was no significant difference in incidence of wound infection. Wound dehiscence and requirement of burst abdomen repair was significantly higher in continuous suture group as compared to interrupted suture group, but mean closure time and mean suture length. were significantly higher in interrupted suture group. **Conclusion**

Wound dehiscence is the main side effect of emergency laparotomy, increasing morbidity and future hospital expenses and the need for a second abdominal burst operation. According to our research, the interrupted suturing technique for abdominal closure is superior in terms of major post-operative problems, even though longer and longer sutures are needed.

**Key words:** Interrupted suturing; Continuous suturing; Rectus sheath closure; Exploratory laparotomy; Wound dehiscence; Burst abdomen

## Introduction

Exploratory laparotomy performed across the midline is essential for the diagnosis and treatment.of several potentially fatal abdominal diseases [1]. Closing the abdominal wall carefully thereafter toEnsuring good healing and minimizing problems is crucial to the success of these surgeries. The

surgeon's objective is to avoid incisional hernias and acute wound dehiscence, both of which may occur after surgery [2]. A strong and infection-proof wound closure is essential. In order to do this, the closure must be quick, effective, tension- and ischemia-free, patient- and surgeon-friendly, and aesthetically pleasing. Therefore, one has to adhere to wound closure guidelines [3]. The risk of developing an incisional hernia after median laparotomy is between 5% and 20%.

One major surgical operation is exploratory laparotomy. The most popular method for opening the abdomen is midline laparotomy because it is easy to do, offers sufficient exposure to all four quadrants, and allows for rapid exposure with little blood loss. [4]

The linea alba, a weak and tendinous zone, must be opened during a midline laparotomy. When the fibers of the linea alba are sectioned vertically to enter the peritoneal cavity, the linea becomes weaker. These fibers are therefore exposed to the tension created by the mechanical forces acting on the linea alba when it is closed with sutures. [5] Laparotomy wounds have been closed in various ways in terms of continuous versus interrupted closure, single layer versus mass closure, and absorbable versus non-absorbable sutures. The continuous sutures have the advantage of evenly distributed tension across the suture line and being more expedient. It has the disadvantage of being a single suture holding the fascia together. The multiple interrupted suture method has been used successfully for many years, but it has the disadvantage of being time-consuming to perform and of isolating the tension of each individual Stitch. [6-7]

Incisional hernia, wound dehiscence, wound infection, and suture sinus development are among the problems that might occur after fascial closure. Poor surgical technique, chronic intra-abdominal pressure, and local necrosis from infection are the main reasons, though they can also come from patient variables, poor suture material selection, and bad technique. [6-7] The kind of closure may not be as significant in elective patients with acceptable nutritional status and no other dehiscence-related risk factors, but it may be crucial in emergency patients with several risk factors for dehiscence or abdominal rupture. the proper abdominal closure procedure. [8]

Following an emergency midline laparotomy, abdominal fascial dehiscence is a serious surgical consequence. It might manifest as a late consequence (incisional hernia) or an early one (burst abdomen with evisceration and partial dehiscence). A significant complication linked to a high morbidity and mortality rate is postoperative total wound dehiscence, an undesirable condition. These patients typically experience a high prevalence of incisional hernia (up to 45%) [9], numerous dressing changes, the creation of fecal fistulas, and surgery for secondary fascial closure. These procedures are linked to noticeably higher morbidity. When a patient has an elective laparotomy and is in good nutritional condition with no additional risk factors for rupture, the type of closure may not be especially important; however, in impoverished nations like India, most patients present with one or more risk factors such as prolonged intraperitoneal sepsis and malnutrition. [10] So the aim of the study is rectus sheath closure techniques in exploratory laparotomy: continuous versus interrupted suturing.

## MATERIALS AND METHODS

The present study was a hospital-based, prospective, randomized observational study that was conducted in a tertiary care hospital and medical college with a time frame of about 1 year from ethical approval. A total number of 60 patients of age group 20–70 years were admitted to the general surgery ward of (medical college name), undergoing exploratory laparotomy.

### Inclusion criteria

All patients presenting in the emergency surgical ward who
undergoing exploratory laparotomy through midline incision were included in the study.

### Exclusion criteria

The following criteria were excluded from the study:

1. Patients under the age of 18 years

2. Patients with previous abdominal surgery with midline incision scar.
3. Patients with comorbid conditions such as renal failure, malignancy, undergoing radio or chemotherapy, and collagen vascular disease. Patients with increased intra-abdominal pressure intraoperatively.

## RESULTS

**Table 1: Distribution of Technique of suturing**

| **Technique of suturing** | Continuous suturing (Mean± SD) | Interrupted suturing (Mean± SD) | P-value |
|---|---|---|---|
| **closure time:** | 31.2±3.85 | 43±5.1 | 0.0000 |
| **Suture length** | 88.3±4.9 | 95.23±5.9 | 0.00006 |
| **Hospital stay** | 9.7±1.8 | 8.5±1.4 | 0.0055 |

We found that in continuous suturing, the mean closure time (mean ± S.D.) of patients was 31.2 ± 3.85. In interrupted suturing, the mean closure time (mean ± S.D.) of patients was 43 ± 5.1. The difference of mean closure time with both techniques of suturing was statistically significant (P<0.0001), as shown in Table 1. In continuous suturing, the mean suture length (mean ± S.D.) of patients was 88.3 ± 4.9. In interrupted suturing, the mean suture length (mean ± S.D.) of patients was 95.23 ± 5.9. The difference of mean suture length with both techniques of suturing was statistically significant (P=0.00006), as shown in Table 1. In continuous suturing, the mean hospital stay (mean ± S.D.) of patients was 9.7 ± 1.8. In interrupted suturing, the mean hospital stay (mean ± S.D.) of patients was 8.5 ± 1.4. The difference in mean hospital stay with both techniques of suturing was statistically significant (P=0.0055), as shown in Table 1.

**Table 2: Association Technique of suturing**

| | | Continuous suturing | | Interrupted suturing | | Total | |
|---|---|---|---|---|---|---|---|
| | | No. | % | no | % | no | % |
| **Wound infection** | Reoperation did not require prersent | 13 | 43.3 | 10 | 33.3 | 23 | 38.33 |
| | Reoperation did not require absent | 17 | 56.7 | 20 | 66.7 | 37 | 61.7 |
| **Wound dehiscence** | **Wound dehiscence occurred** | 6 | 20 | 0 | 0 | 6 | 10 |
| | **Wound dehiscence did not occure** | 24 | 80 | 30 | 100 | 54 | 90 |
| Reoperation required | **Requirement of reoperation** | 17 | 56.7 | 12 | 40 | 29 | 48.3 |
| | **Requirement of reoperation not required** | 13 | 43.3 | 18 | 60 | 31 | 51.7 |
| **Type of reoperation** | Enmass closure of burst abdomen | 9 | 30 | 0 | 0 | 9 | 15 |
| | Secondary suturing | 7 | 23.3 | 8 | 26.7 | 15 | 25 |
| | Reoperation not required | 14 | 46.7 | 22 | 73.3 | 36 | 60 |

In continuous suturing, 13 (43.3%) patients had wound infection. In interrupted suturing, 10 (33.3%) patients had wound infection. The association of wound infection versus the technique of suturing

was not statistically significant (p=0.261), as shown in Table 2. In continuous suturing, 6 (20) patients had wound dehiscence. There was no wound dehiscence in interrupted suturing. The association of wound dehiscence versus the technique of suturing was statistically significant (P=0.258), as shown in Table 2. In continuous suturing, 17 (56.7%) patients had a requirement for reoperation in interrupted suturing, and 12 (40%) patients had a requirement for reoperation. The association of the requirement of reoperation versus the technique of suturing was not statistically significant (P=1.29), as shown in Table 2. In continuous suturing, 9 (30%) patients had en masse closure of a burst abdomen, and 7 (123.3%) patients had secondary suturing. In interrupted suturing, no patient had to undergo en masse closure of a burst abdomen; 14 (46.7%) had secondary suturing. The association of type of reoperation versus technique of suturing was statistically significant. (P=0.0064), as shown in Table 2.

## DISCUSSION

The standard technique for abdominal incisions, the midline laparotomy, has been widely adopted for its simplicity, efficiency in providing exposure, and its typically blood-sparing nature [11-12]. The debate over the optimal closure technique—choosing between continuous and interrupted sutures, the size of fascial bites, stitch intervals, and the suture material itself—remains unresolved (13). It is during the critical postoperative window, between the fifth and eighth days, where wound integrity is most reliant on the mechanical properties of the chosen suture technique [13]. The strength of the wound, which is paramount during this period, is directly affected by these mechanical characteristics [14].

The ideal abdominal closure technique is one that is technically straightforward and quick, does not encourage wound infection or inflammation, preserves tensile strength during the healing process with adequate tissue approximation, and is well-tolerated by patients. Often, non-scientific criteria determine the precise approach utilized to close the individual's abdominal fascia. The surgical literature has not yet clearly shown an ideal method for closing abdominal fascia, particularly in emergency situations, due to challenges brought on by variously customized study designs.

Agrawal et al. found that the study included 139 male and 35 female patients between the ages of 10 and 75 years. The incidence of wound infection (P=0.656), dehiscence (P=0.997), and incisional hernia (P=0.930) at 3 months and 4 years (P=0.910) was not statistically significant. There was no sinus formation in Groups A and B; however, two patients in Group C and six patients in Group D did develop suture sinus (P=0.003). Suture material and technique of closure do not influence wound outcome in patients with peritonitis, except for a significantly lower incidence of sinus formation when non-absorbable sutures are used. [15] Kumarr et al. found that in post-operative period patients closed by mass closure technique, 8 patients (16%) had post-operative complications in the form of seroma in 2 patients (4%), infection in 3 patients (6%), wound gaping in 2 patients (4%), and incisional hernia in 1 patient (2%) and no patient had burst abdomen whereas in layered closure, total 16 (32%) patients had complications as seroma in 5 patients (10%), wound infection in 4 patients (8%), gaping in 4 patients (8%) burst abdomen in 1 patient (2%), and incisional hernia in 2 patients (4%). The single-layered closure technique is better than the layered closure in terms of operation time and post-operative complications such as a seroma, infection, wound gaping, burst abdomen, and incisional hernia. [16]

Abd El Shahid et al. found that wound infection was noticed in 12/168 (7.2%) cases, and 2/168 (1.2%) patients developed wound dehiscence. The present study demonstrates that the new technique (Moharam Repair) of abdominal wall closure after midline laparotomies is efficient in reducing post-operative wound dehiscence (burst abdomen). Hence, this technique is applicable, safe, and can minimize morbidities and mortalities related to wound dehiscence (as a short-term complication) after midline exploratory laparotomies. [17] Rahman et al. found that a total of 14% of wound infections was detected in the interrupted suture group, whereas wound infection was 18% in the continuous suture group of wound closure. Although the wound infection is higher in Group II, the difference in wound infection is not statistically significant between the two groups. The wound pain assessed in 7

postoperative days was higher in the continuous closure group than in the interrupted group, but the difference was not significant. There is no significant difference in wound infection and wound pain between the interrupted and continuous suture groups in clean-contaminated laparotomy. [18]
Balaji et al. found that group A was found to have less wound dehiscence (P=0.001 for partial and P=0.008 for complete) and a shorter period of hospital stay (P=0.054), which were statistically significant. Surgical site infections were similar in both groups. Group B was found to have less time taken for closure (P=0.003) and less length of suture material used (P=0.003), which were statistically significant. The interrupted-x technique of rectus sheath closure reduces the rate of wound dehiscence and the period of hospital stay, although it consumes more length of suture material and more time for suturing as compared to conventional continuous closure. [19]
We showed that in continuous, 13 (43.3%) patients had wound infection. In interrupted, 10 (33.3%) patients had wound infection. Association of wound infection versus technique of suturing was not statistically significant (P=0.261). In continuous, 6 (20%) patients had wound dehiscence. Association of wound dehiscence versus technique of suturing was statistically significant (P=0.258). in continuous, 15 (40.5%) patients had requirement of reoperation. In interrupted, 17 (56.7%) patients had requirement of reoperation. Association of requirement of reoperation versus technique of suturing was not statistically significant. In continuous, 9 (30%) patients had enmass closure of burst abdomen and 7 (23.3%) patients had secondary suturing. In interrupted, no patient had to undergo enmass closure of burst abdomen and 14 (46.7%) patients had secondary suturing. Association of type of reoperation versus technique of suturing was statistically significant (P=0.0064).
Singal et al. found that the incidence rates of wound infection, dehiscence, suture sinus formation, and incisional hernia were recorded. The patients were followed up for a period of 1 year. Out of the 60 patients, the rates of wound pain, discharge, and dehiscence in Group A were 30%, 23.3%, and 26.7%, and in Group B were 6.7%, 16.6%, and 23.3%. There was zero burst abdomen in Group A compared to one burst abdomen in Group B. Suture sinus formation, chronic wound infection, and stitch granuloma were one each in Group A and were zero in Group B. Incisional hernia was not found in any of the groups. [20]
Hansda et al. found that the mean postoperative hospital stay was 9.1±3.6 days (range 3–30 days) and was affected by the post-operative course. Post-operative complications were seen in 40.8%, and it was affected by the indication for surgery, P=0.01. The complications encountered were wound infection, sepsis, chest infection, DVT, wound dehiscence, and incisional hernia in 29.6%, 6.8%, 3.4%, 1%, 0.5%, and 0.5%, respectively. [21] We found continuous suturing; the mean hospital stay (mean ± S.D.) of patients was 9.7 ± 1.8. In interrupted suturing, the mean hospital stay (mean ± S.D.) of patients was 8.5 ± 1.4. The difference in mean hospital stay with both techniques of suturing was statistically significant (P=0.0055) in that the mean hospital stay was continuous.

**Limitations of the study**

In spite of every sincere effort, my study has lacunae.

**Conclusion**

According to a study, using the continuous suturing approach takes less time. When compared to continuous suturing, the mean closure time for interrupted suturing was statistically substantially longer. There was a statistically significant difference in the mean suture length between the interrupted and continuous suturing techniques. We discovered that the two groups' hospital stays did not differ much. It was discovered that there was no statistically significant correlation between suturing technique and wound infection. There was a statistically significant increase in wound dehiscence using the continuous suturing approach as opposed to the interrupted suturing technique. Reoperation requirements did not significantly differ between the two groups in our investigation. There was statistically significantly more secondary suturing with the interrupted suturing approach than with the continuous suturing technique. The primary complication of emergency laparotomy is wound dehiscence, which raises morbidity and necessitates a subsequent burst abdomen operation

and hospital expenses because the continuous suturing technique requires more en masse closure of the burst abdomen, a requirement that is statistically significant. Despite requiring greater suture length and time, our study showed that the interrupted suturing approach of abdominal closure is superior in terms of significant postoperative problems.

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