VOLUME - 11, ISSUE - 11, NOVEMBER - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Surgery

# A COMPARATIVE STUDY ON CONTINUOUS AND INTERRUPTED METHODS OF ABDOMINAL FASCIA CLOSURE IN MIDLINE LAPAROTOMY WOUNDS OF PATIENTS WITH PERFORATION PERITONITIS

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## ABSTRACT

**Introduction:** Wound dehiscence/burst abdomen is a very serious postoperative complication associated with high morbidity and mortality. It has a significant impact on health care cost for the patient. Abdominal wound dehiscence is the major cause of morbidity following any emergency laparotomy. The aim of the study was to compare wound dehiscence between the patients underwent two different suture technique of abdominal fascia closure. **Materials and Methods:** The study was conducted for patients admitted in Rajah Muthiah Medical College and Hospital, Chidambaram at Department of General Surgery with perforation peritonitis undergoing emergency midline laparotomy incision during the study period of July 2021 to July 2022. Out of 80 patients, 40 were randomized using computer aided random numbers to have the abdominal wall closed by interrupted closure technique and remaining 40 by continuous closure and were grouped as Group A and group B respectively. Postoperatively patients were observed for immediate post-operative complications like post-operative wound infection, stitch sinus formation, post-operative wound dehiscence and late post- operative complications like persistent wound pain and incisional hernia. Follow up for stitch sinus was done at 1st and 3rd months. **Result:** It was observed that 57.5 % of the 40 patients who underwent continuous closure presented with wound infection compared to 35% of wound Infection in interrupted sutures. 85% of the patients from continuous suture with interrupted closure for laparotomy wounds are free of wound gaping. 37.5% patients who undergone continuous closure had suture sinus as complication. This percentage of suture sinus is less in interrupted closure when compared to the continuous closure. **Conclusions:** This study proves that the interrupted method of abdominal fascia closure in midline laparotomy wound is more beneficial than continuous abdominal fascia closure in the midline laparotomy wounds of patients with perforation peritonitis

**KEYWORDS :** Perforation Peritonitis, Emergency midline laparotomy, Abdominal fascial closure, wound dehiscense, wound infection, interrupted closure

## INTRODUCTION:

Majority of the surgeries performed by the general surgeons take place within the abdomen. Midline laparotomy is one of the most common surgeries performed in emergency as well as elective settings. During midline laparotomy the organs that are visualized and examined are hepatic and biliary structures like gall bladder, bile duct, Gastric regions including stomach and lower oesophagus, Small intestine, Large bowel that includes ascending colon, hepatic and splenic flexure of colon, descending and sigmoid colon, Rectum , Uterus, ovary, fallopian tube, in females.[1] The major complications following a laparotomy for perforation peritonitis cases are wound dehiscence, wound infection, sinus tract formation. Enmass closure of abdomen wall is preferred over layered closure.

Ideal wound closure should be with minimal or no wound complications like wound infections or gapping and produce cosmetically good scar. Suture to wound length ratio of 4:1 is used.[3] In elective settings the method of rectus closure is not important because they do not have risk factors for wound dehiscence or infection when compared to emergency settings.[2] Skin closure in presence of contamination leads to wound infection, so this factor is excluded during the study.[5] We evaluate the benefits of interrupted and continuous closure of abdominal fascia using monofilament nonabsorbable prolene suture material in midline laparotomy wounds of patients with perforation peritonitis.[4]

## AIM OF STUDY:

The aim of this duty is to evaluate the benefits of interrupted and continuous closure of abdominal fascia in midline laparotomy wounds of patients with perforation peritonitis.3

This study aims at studying the percentage of wound dehiscence, wound infection, suture sinus by comparing the interrupted and continuous closure of abdominal fascia.

## MATERIALS AND METHODS:

The study was conducted for patients admitted in Rajah Muthiah Medical College and Hospital, Chidambaram at Department of General Surgery with perforation peritonitis undergoing emergency midline laparotomy incision during the study period of July 2021 to July 2022.

### Inclusion Criteria:

- Patients aged 15-75 years of both genders.
- Patients posted for emergency laparotomy.
- Patients with perforation peritonitis

### Exclusion Criteria:

- Patients with previous abdominal surgeries with midline laparotomy incision
- Patients on radio or chemotherapy and with collagen vascular disease
- Patients who underwent surgery by Grid-iron, subcostal and Para median incisions.

### Sample Size:

Totally 80 patients with perforation peritonitis were divided into two groups, 40 in Group A and 40 in Group B admitted from the period from July 2021 to July 2022.

Out of these 80 patients, 40 were randomized using computer aided random numbers to have the abdominal wall closed by interrupted closure technique and remaining 40 by continuous closure and were grouped as Group A and group B respectively

- Group A: patients undergoing Interrupted closure.
- Group B: patients undergoing Continuous closure.

1. In all cases, incision was not extended below the arcuate line.

2.In the first group, abdomen was closed using the single layer closure technique with No. 1 Prolene curved cutting needle as ingterrupted sutures.

3. In the other group, the abdomen was closed in using the single layer closure technique in with No. 1 Prolene curved cutting needle as continuous non locking sutures.

4. The patients were followed up for minimum 3 months directly. Patients who did not turn up for follow up were asked to notify the development of any wound complication through postal correspondence.

All essential pre operative investigations necessary for pre anesthetic evaluation and fitness for surgery were taken. Preoperatively all patients received Inj. Ceftriaxone 1 gm IV. Stat. Postoperatively all patients received Inj. Ceftriaxone 1 gm i.v bid Inj, Metronidazole 500 mg i.v T.D.S for 5 days, as antibiotics. All patient received analgesics. All patients were operated either under general anaesthesia or epidural anaesthesia. During the operation, a record was kept regarding the time required for closure and the type of suture material used. Postoperatively patients were observed for immediate post- operative complications like post-operative wound infection, post-operative wound dehiscence and late post- operative complications like persistent wound pain incisional hernia and stitch sinus. Follow up of stitch sinus was done at 1st and 3rd months. Patients are asked to fill the questionnaires in each follow up. Data of each patient will be collected as per the proforma. Due to the risk of contamination skin of the wound was not sutured and sterile dressing was applied. After 48 hours wound was opened and inspected for sign of infection serially and secondary suturing was done if there were no signs of infections. If any signs of infection is present wound culture was taken and antibiotics were according to sensitivity.

**Method of closure in group A:**

Interrupted closure was performed using No. 1 Prolene curved cutting needle Each bite was taken 2 cm from the raw edge of linea Alba, interrupted suture made. Knot placed away from the cut edges of linea Alba and successive bites 1 cm apart from each other. The edges of linea Alba were gently approximated without strangulation with an attempt to keep a suture to wound length ratio of 4:1.

**Method of closure in group B:**

Continuous closure was performed using No.1 Prolene curved cutting needle. Initial suturing started with placing a knot at the v shaped lower edge of the rectus sheath. After placing the initial knot continuous suturing is started .Care was taken to place each bite 2 cm from the raw edge of linea alba and successive bites 1 cm apart from each other. The edges of linea Alba were gently approximated without strangulation of underlying structures with an attempt to keep a suture to wound length ratio of 4:1.The final knot placed at the upper edge of rectus that was incised.

## RESULT ANALYSIS:

**Table-1: Age distribution in Group A**

| Age group (in years) | Number of subjects | Percentage (%) |
|---|---|---|
| 30-40 | 10 | 25 |
| 40-50 | 8 | 20 |
| 50-60 | 8 | 20 |
| 60-70 | 14 | 35 |
| Total | 40 | 100 |

In our study, group A consist of 40 patient who underwent interrupted closure of wounds. About 35% includes age group from 60- 70 as on the above table.

**Table-2: Age distribution in Group B**

| Age group (in years) | Number of subjects | Percentage |
|---|---|---|
| 30-40 | 8 | 20 |
| 40-50 | 16 | 40 |
| 50-60 | 5 | 12.5 |
| 60-70 | 11 | 27.5 |
| Total | 40 | 100 |

In our study, group B consist of 40 patient who underwent continuous closure of wounds. About 40% includes age group from 40-50 as on the above table.

**Table-3: Gender distribution in Group A**

| Gender | Number of subjects | Percentage |
|---|---|---|
| Male | 28 | 70 |
| Female | 12 | 30 |
| Total | 40 | 100 |

**Table-4: Gender distribution in Group B**

| Gender | Number of subjects | Percentage |
|---|---|---|
| Male | 22 | 55 |
| Female | 18 | 45 |
| Total | 40 | 100 |

Since perforation is most common in people who suffer from chronic peptic ulcer disease, male predominance is noted in both the study group

**Table-5: Comparison of post-operative wound infection in both the groups**

| Type of closure | Post-operative wound infection | | | | Chi square value | P value |
|---|---|---|---|---|---|---|
| | yes | % | No | % | 4.0729 | 0.04357 |
| Interrupted closure | 14 | 35 | 26 | 75 | | |
| Continuous closure | 23 | 57.5 | 17 | 42.5 | | |

The chi-square value is 4.0729. The P value is 0.04357.

This analysis shows that the result is significant at $p < 0.05$.

This comparison shows that post-operative wound infection is higher in continuous closure when compared to interrupted closure.

**Table-6: Comparison of wound gaping in both the groups**

| Type of closure | Post-operative wound gaping | | | | Chiare value | P value |
|---|---|---|---|---|---|---|
| | Yes | % | no | % | 4.2667 | 0.03886 |
| Interrupted closure | 6 | 15 | 34 | 85 | | |
| Continuous closure | 14 | 35 | 26 | 65 | | |

The chi square value is 4.2667. The value of P is 0.038867.

This shows that the result is significant as the P value is $p < .05$.

This comparison shows that post-operative wound gaping formation is higher in continuous closure when compared to interrupted closure.

**Table-7: Comparison of suture sinus in both the groups during follow up**

| Type of closure | Post-operative suture sinus at follow up | | | | Chi square | P value |
|---|---|---|---|---|---|---|
| | yes | % | no | % | 4.0125 | 0.04516 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Interrupted closure | 7 | 17.5 | 33 | 82.5 | | |
| Continuous closure | 15 | 37.5 | 25 | 62.5 | | |

The chi square value is 4.0125. The value of P is 0.045163.

This shows significant result as the value of $p < 0.05$.

80 patients who got admitted in the ward with the diagnosis of hollow viscus perforation with peritonitis and underwent explorative laparotomy with midline incision were studied. Among them 40 patients who were randomly selected underwent interrupted closure of abdominal fascia in the midline laparotomy incision and was grouped as group A. 40 other patients who too were randomly assigned underwent continuous closure of abdominal fascia in the midline laparotomy incision and was grouped as group B. The following results were inferred from the above study.

Among the 40 group A patients who underwent interrupted closure of wounds of the midline laparotomy wound for perforation peritonitis 35% of the patients belonged to the age group 60 – 70 years whereas among group B the 40 patient who underwent continuous closure of wounds, 40% belong to the age group 40-50 years . Inferring from both the groups, we conclude majority of patients who underwent emergency midline laparotomy for perforation peritonitis belonged to the age groups of 40-50 and 60- 70.This age distribution can be attributed to the predisposing factors of disease such as NSAID abuse, alcohol, smoking and malignancies.

Comparing the gender distribution between both the study groups, male gender dominated the study. Since the study is conducted on patients with perforation of hollow viscus, this entity is more common among males due to increased prevalence of peptic ulcer disease, NSAID abuse, irregular dietary habits, smoking and work stress which are most common predisposing factors for perforation of hollow viscus. So in our study dominance of male observed in both the groups.

Wound infection is the most common disturbing complication among the patients who undergo midline laparotomy for perforation peritonitis in the emergency setting. This is due to the inflammation caused by the ongoing peritonitis leading to fat necrosis due to the residing micro septic foci. It was observed that 57.5 % of the 40 patients who underwent continuous closure presented with wound infection compared to 35% of wound Infection in group A. This signifies that there is less incidence of wound infection in patients of Group A who had interrupted closure of abdominal fascia in emergency midline laparotomy wounds.

The incidence of wound gaping is higher in Group B patients who had continuous closure of laparotomy wound. 85% of the patients from Group A with interrupted closure for laparotomy wounds are free of wound gaping. This shows the interrupted closure is better than continuous closure as the wound gaping complication is more in patients with continuous closure.

Post operatively follow up was done for the patients, in which 37.5% patients who undergone continuous closure had suture sinus as complication. This percentage of suture sinus is less in interrupted closure when compared to the continuous closure.

## DISCUSSION:

This study aims at comparing the benefits of interrupted and continuous closure of abdominal fascia in midline laparotomy wounds of patients with perforation peritonitis.[7-8] Closure of abdomen is one of the important step in laparotomy as it decides the incidence of majority of wound site complications and post-operative morbidity.[6] Technical errors such as misplaced incisions , wrong choosing of suture material, insecure knotting, less secured tightness of sutures, compromising the blood supply of rectus sheath can lead to complications including hematoma, stitch abscess, infection, wound dehiscence or evisceration, incisional hernia or an unsightly scar. Prevention of herniation of abdominal contents through the incisional wound resulting in burst abdomen or herniation through a weak scar resulting in incisional hernia are the main aims of a surgeon closing laparotomy wounds. The best method of abdominal closure is one that maintains tensile strength throughout the healing process with good tissue approximation.

Since majority of surgeons prefer suture material with high tensile strength such as No. 1 prolene, tissue breakdown becomes essentially the cause for majority of wound failures. Assuming that the abdominal wall doesn't have any gross specific directional weakness for the cut through phenomena i.e. the thread cutting through the abdominal wall, the following analysis provides a good comparative analysis of the efficacy of the two methods of suturing.

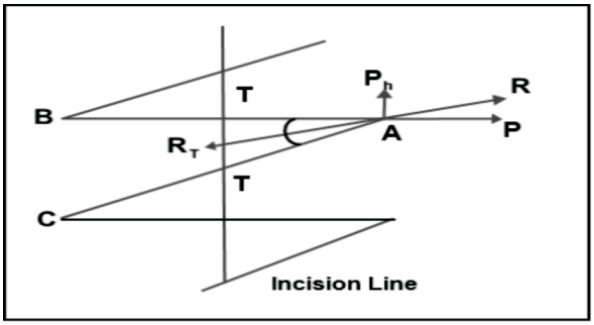


**Fig-1: Continuous suture**

T is the initial tension applied while tying the knots of the suture. The thread tension will always be the same throughout the length of the thread in case of a continuous suture since the thread is free to slide through the abdominal wall. The tension in the thread will rise with the increase in the intra- abdominal forces or patient's movement. Now, because of various factors such as non-equality of longitudinal and circumferential stresses, non-homogeneity and anisotropicity of the abdominal wall, it is almost impossible that the resultant of the additional forces generated in the abdominal wall at point A by coughing, flatulence or movement etc. will be in the same direction as that of the force. To counterbalance these additional forces, the tension T in the thread will have not only to increase in magnitude but has also to reorient the direction of the resultant tension. This tension will be sufficient to cause imbalance between the tensions in the two limbs of the thread at point A leading to slippage of the thread at the suture point as there can't be any differential in the tension in a continuous thread. This leads to distortions in the suture geometry. Thus we find that in Z suture the dynamic changes in the intra-abdominal forces cause "to and fro" movement of the thread causing hacksaw effect on the abdominal wall, leading to distortions in the suture geometry and also leading to additional redundant forces at the suture entry points. It is this "to and fro" motion of the thread (i.e. the hacksaw effect) caused due to the dynamics of abdominal pressures and stretching that makes the continuous sutures of any configuration vulnerable to the cut through phenomena.

### Interrupted sutures:

There is freedom of all the suture limbs to rotate independently which enables the suture arms to balance the net resultant of the forces on the abdominal wall due to thread tension and coughing, movement etc. without causing any state of redundancy or "to and fro" movement of the thread at suture entry point. Thus the absence of any hacksaw effect in the interrupted Suture as occurring in Z continuous suture with every spurt of intra-abdominal forces makes interrupted

sutures more efficient and safer than continuous closure. Continuous closure has always been regarded to compromise the blood supply to the healing edges as compared with the interrupted technique. Therefore interrupted closure has been used to advantage in situations where blood supply is precarious e.g. colon and oesophagus the blood supply to the triangles is cut off from all sides. This will impair wound healing and thus increase the probability of cut through. In the interrupted technique since we do not have any horizontal or vertical cross- arms, the blood supply to the healing edge is not impaired leading to decreased probability of cut through and burst abdomen.

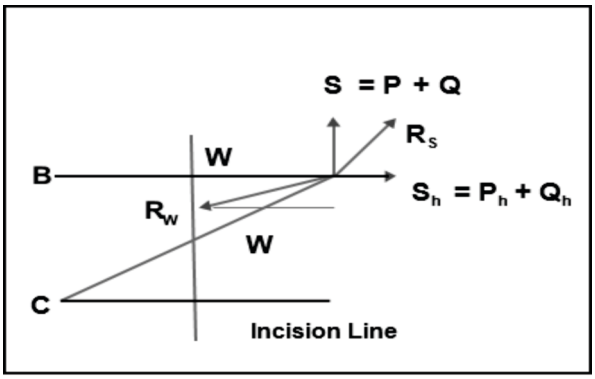


**Fig-2: Interrupted suture**

## CONCLUSION:

This study proves that the interrupted method of abdominal fascia closure in midline laparotomy wound is more beneficial than continuous abdominal fascia closure in the midline laparotomy wounds of patients with perforation peritonitis. The percentage of post-operative surgical site wound complications like wound infections, wound gaping, suture sinus are less in interrupted closure when compared to continuous closure. Though interrupted closure is a bit more time consuming than continuous closure, calculating the risk versus benefit ratio postoperative wound site complications are much less, we can arrive at a conclusion that interrupted closure is more beneficial in abdominal fascia closure of midline laparotomy wounds in patients with perforation peritonitis.

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