ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 03 | March - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARATIVE STUDY BETWEEN MASS CLOSURE AND LAYERED CLOSURE OF MIDLINE ABDOMINAL INCISIONS AT DMCH, LAHERIASARAI, BIHAR

Surgery

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ABSTRACT

Background: Traditionally, a laparotomy wound is closed in layers co-opting the various layers anatomically. A new method of closure, namely single layer closure technique (mass closure technique) has come into vogue.

Aims: This study aims to evaluate the benefits or otherwise between single layer closure and layered closure after comparing it with studies available in literature.

Settings and Design : This study was conducted at Upgraded Department of Surgery, DMCH, Laheriasarai, Bihar, in patients undergoing laparotomy, either planned or emergency.

Materials and Methods: A total of 80 cases were selected at random and the study was carried out over a period of 2 years. The cases were equally divided into two groups of 40. In both groups, vertical midline incision was used. In the first group, abdomen was closed using the single layer closure technique. Continuous suturing with burial of the knots was done in 20 patients and interrupted mass closure was done in another 20 patients. In the other group, the abdomen was closed in layers. The patients were followed up for minimum 6 months. Patients who did not turn up for follow up were asked to notify the development of any wound complication through postal correspondence.

Results: The time required for closure was considerably less when continuous suture technique was used. One patient in the mass closure group and four in the layered group developed post-operative wound infections. One patient in the layered closure group developed a stitch sinus. There were two cases of burst abdomen with the layered closure technique. Two patients in the layered closure group developed incisional hernias 6 months post-operatively.

Conclusions: Single layer closure technique offers certain definite advantage over the layered closure technique with respect to the time required for closure of the incision, incidence of wound dehiscence and the incidence of incisional hernia. However, the true incidence of wound dehiscence (burst abdomen) and incisional hernia cannot be drawn since the study was of short duration and the number of cases was small without a long follow up.

KEYWORDS

Incisional hernia, laparotomy, mass closure

INTRODUCTION

Traditionally, a laparotomy wound is closed in layers co-opting the various layers anatomically. A new method of closure, namely single layer closure technique (mass closure technique) has come into vogue. In this technique, all the layers of the abdominal wall except the skin and subcutaneous tissue are sutured in one layer. Skin is approximated separately with interrupted sutures.

The practical value of any method of abdominal closure can be judged only when it is used in unselected patients by all surgeons who close abdominal wounds irrespective of their degree of training. The current choice for closure of emergency and elective laparotomies in most centers is a continuous mass closure technique using a non-absorbable suture material.

This study aims to evaluate the benefits or otherwise between single layer closure and layered closure after comparing it with studies available in literature.

MATERIAL AND METHODS

This study was conducted at Department of Surgery, Darbhanga Medical College & Hospital, Laheriasarai, Bihar in patients undergoing laparotomy, either planned or emergency.

A total of 80 cases ([Table 1] shows the etiology of the cases), were selected at random and the study was carried out over a period of 2 years. The cases were equally divided into two groups of 40 each. In both groups, vertical midline incision was used. In all cases, incision was not extended below the level of arcuate line. In the first group, abdomen was closed using the single layer closure technique in which all layers of the abdominal wall except the skin and subcutaneous tissue were sutured in one layer with No. 1 Prolene curved cutting needle. Continuous suturing with burial of the knots was done in 20 patients and interrupted mass closure [Figure 1] was done in another 20 patients. In the other group, the abdomen was closed in layers using a continuous stitch of No. 2-0 vicryl for peritoneum and posterior rectus sheath and No. 1-0 Prolene for anterior rectus sheath. The patients were followed up for minimum 6 months directly. Patients who did not turn up for follow up were asked to notify the development of any wound complication through postal correspondence. Patients received Ampicillin (500 mg, q.i.d * 5 days), gentamicin (80 mg, b.d * 5 days), and Metronidazole (500 mg, t.d.s * 2 days, only in clean -contaminated and contaminated surgeries) as antibiotics. All patients were operated under general anesthesia.

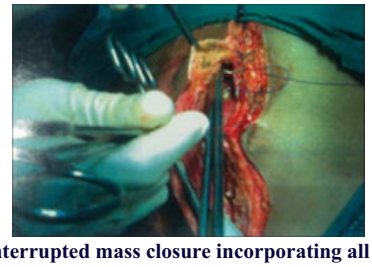

Figure 1: Interrupted mass closure incorporating all three layers

Table 1: Etiology of cases in the current study

Etiology
Clean (21 cases)
Incisional hernia repair (14 cases)
Highly selective vagotomy (7 cases)
Clean-Contaminated (30 cases)
Cholecystectomy (24 cases)
Pyloroplasty with truncal vagotomy (4 cases)
Hiatus Hernia – fundoplication (2 cases)\
Contaminated (29 cases)
Intestinal obstruction (22 cases)
Penetrating abdominal trauma (7 cases)

During the operation, a record was kept regarding the time required for closure and the type of suture material used. Patients were observed

post-operatively 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 of incisional hernia was done at 3, 6, 9 and 12 months.

RESULTS

Of the 80 patients in the study, 55 were male and 25 were females. The age of the patients ranged from 10 to 90 years; a majority were in the age group of 61 to 70 years. Two patients who developed incisional hernia were of 62 and 72 years of age. The average length of the incision was 16 cm (15-17 cm). Of the 21 clean cases, mass closure was done in 11 cases and layered closure in 10 cases. The numberumber of mass closures and layered closures were equal in the 30 clean contaminated cases and of the 29 contaminated cases; layered closure was done in 15 cases and mass closure in 14 cases [Table 1]. Of the 80 surgeries, 45 were elective surgeries and 35 were emergency laparotomies. Of the 45 elective surgeries, layered closure was done in 30 patients and mass closure in 15 patients. Twenty-five of the emergency laparotomy patients underwent mass closure and the other 10 underwent layered closure. The time required for closure was considerably less when continuous suture technique was used. Average time for mass closure (20 minutes) was considerably less as compared to layered closure (35 min). One patient in the mass closure group for emergency surgery and four in the layered group (two each of emergency and elective surgeries) developed post-operative wound infections. One patient in the layered closure group developed a stitch sinus. There were two cases of burst abdomen [Figure 2] with the layered closure technique which were managed subsequently by taking through and through interrupted retention sutures with No. 1 monofilament Nylon along with closure of abdominal wall with the mass closure technique. There was no recurrence of a burst abdomen nor did they develop an incisional hernia. One case each of the layered and mass closure techniques had persistent wound pain at the end of 2 months. Two patients in the layered closure group developed incisional hernias [Figure 3] 6 months post-operatively.

Figure 2: Burst abdomen following midline laparotomy

Figure 3: Incisional hernia following layered closure of midline laparotomy

DISCUSSION

The surgeon's aim is to restore the structural integrity of incised or injured tissues to as near normal as possible. The importance of the role played by sutures in this cannot be exaggerated; however, the suture technique has been found out to be equally important in surgery. In spite of perfect asepsis, improved surgical skills, antibiotics, etc. wound complications comprise nearly 50% of all post-operative complications. Hence, there is a constant search for a suture technique which would minimize the wound failure rate.

In all the reported series in which comparison was done between layered and mass closure techniques, the incidence of wound dehiscence was less with the mass closure technique. In our study, no case of wound dehiscence was noted in the mass closure group. The layered closure group presented with two cases of burst abdomen. The results of our study were statistically similar to those by Higgins et.al. and Bucknall *et al.*

The problem of incisional hernia is closely related to the suture technique. Ellis had reported a decrease in the incidence of incisional hernia with the mass closure technique which is consistent with our study. However, Bucknall *et al.* reported no significant difference in the incidence of incisional hernias. Various studies have shown that incisional hernias may occur many months after the operation and hence a suture technique that would provide enough tensile strength to the wound for a long time is essential. Late appearance of the incisional hernia was attributed to the fact that the aponeurosis which gives maximum strength to the abdominal wounds heals much more slowly than the skin because of poor vascularity.

T. P. N Jenkins has stressed on the importance of suture length to wound length in the prevention of burst abdomen. He found that there was a 30% lengthening in the length of the wound in the early post-operative period due to abdominal distension, wound edema, etc. If an adequate length of suture is not placed to allow for this distension, the sutures cut out resulting in wound disruption. Hence, he advocates the usage of suture of at least four times length of the length of the wound (SL:WL4:1) for the mass closure technique. We have followed this principle in our study and there was no incidence of burst abdomen in this group.

Various authors who have compared the continuous and interrupted suture techniques have concluded that the continuous sutures have an advantage of an evenly distributed tension across the suture line, being more expedient, fewer knots and stitch sinuses. It has an advantage of being a single suture line holding the fascia together. Results of our study show that the interrupted suture has the disadvantage of being time consuming and isolating the tension to each individual stitch.

Although a number of factors are responsible for the occurrence of wound infection, the choice of suture material and suture technique also has an important role to play. The presence of peritonitis, contamination by bowel contents, hypoproteinemia, obesity, immunosuppression, and diabetes are some of the common factors which increase the wound infection rates. In our study, the rate of infection in the mass closure group was less as compared to the layered closure group.

For single layer closure of abdominal incisions, non-absorbable materials like No. 1 monofilament nylon, or No. 1 Prolene, are most often used; therefore, persistent stitch sinuses are likely to occur if care is not taken to bury the knot. In our study, one patient in the layered closure group developed a stitch sinus. Later on, we made a conscious effort to bury the knots inside and there were no instances of stitch sinus thereafter. There was no incidence of stitch sinus in the mass closure group.

Spencer in his study observed that the study significantly reduces the time required for closure. This may prove to be vital in emergency cases where every minute of the operating time save can influence the final outcome. There is at least 50% reduction in the time required for closure. This is true irrespective of the experience of the surgeon.

CONCLUSION

The single layer closure technique offers certain definite advantage over the layered closure technique with respect to the time required for closure of the incision, incidence of wound dehiscence and the incidence of incisional hernia. However, the true incidence of wound dehiscence (burst abdomen) and incisional hernia cannot be drawn since the study was of short duration and the number of cases was small without a long follow up.

The disadvantages of the single layer closure technique are as follows. There was significantly higher incidence of persistent sinus formation and wound pain with the single layer closure technique. But this can be minimized by taking special care in burying the knots inside.

The technique of tying the knots has to be practiced before it is used; otherwise the knot is likely to slip.

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