International Surgery Journal
Aghara CB et al. Int Surg J. 2020 Nov;7(11):3713-3717
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20204678

Original Research Article

Prospective comparative study of modified Smead Jones versus conventional continuous method of fascial closure in emergency midline laparotomy

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Received: 28 August 2020
Revised: 09 October 2020
Accepted: 15 October 2020

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ABSTRACT

Background: A midline incision is simple, quick, bloodless and provides excellent exposure. So it is most commonly used access route for emergency laparotomy. But compare to other incision it increases incidence of postoperative wound dehiscence and an incisional hernia. Prevention of this complication is important in reducing post-operative morbidity and mortality. Present study was undertaken to compare the effectiveness of modified Smead Jones versus conventional continuous closure technique in terms of wound infection and wound dehiscence.
Methods: A total of 100 patients from July 2017 to November 2019 were randomized in two groups of 50 each. Group A in which linea alba closure was done by modified Smead Jones technique and group B in which linea alba closure was done by conventional continuous closure technique.
Results: 12 patients in group A and 28 patients in group B developed wound infection and 1 patient in group A and 7 patients in group B developed wound dehiscence.
Conclusions: Modified Smead Jones technique is better than conventional continuous closure technique in management of closure of emergency midline laparotomy.

Keywords: Continuous closure, Emergency midline laparotomy, Modified Smead Jones technique, Wound dehiscence

INTRODUCTION

The occurrence of sudden disruption of the abdominal laparotomy wound is a major disaster in the life of a patient who has undergone an abdominal surgery and a major psychological trauma to the patient as well as the surgeon. Acute wound dehiscence is defined as postoperative separation of the abdominal musculoaponeurotic layers within 30 days after operation.[1] It is common complication of emergency laparotomy especially in Indian setup as majority of our patients are from rural background with poor nutritional status due to poverty and poor access to better health care facilities. There have been a number of studies evaluating various closure techniques and suture materials to prevent wound dehiscence following emergency midline laparotomy. Studies carried out in the West have found no significant difference in the risk of burst between continuous and interrupted methods. In developing countries such as India, most patients present in emergency setting with one or more risk factors such as prolonged intraperitoneal sepsis and malnutrition. Hence, it is imperative for us to ascertain the safest method of closing the abdomen.[2]

The present study was undertaken to compare the risk of wound infection and wound dehiscence between modified smead jones technique and conventional continuous technique in emergency midline laparotomy.

Aim

To compare effectiveness of Modified Smead Jones technique and conventional continuous closure technique in emergency midline laparotomy and to compare the incidence of wound infection and wound dehiscence between both techniques.

METHODS

The present prospective comparative study was conducted between July 2017 to November 2019 in the Department of Surgery, P. D. U. Government Medical College and Hospital, Rajkot, Gujarat, India. A total of 100 patients were randomized in two groups of 50 each who underwent emergency midline laparotomy with two different techniques of linea alba closure.

Group A: Linea alba closure was done using Modified Smead Jones technique.

Group B: Linea alba closure was done using Conventional continuous technique.

Suture techniques

Modified Smead Jones technique: This comprised a far bite starting at 2 cm on the edge of linea from outside-in and then taking a near bite of 0.5 cm on the other side inside-out- a near bite on the same side outside-in and then a far bite on the other side inside-out. The suture was next converted to a horizontal mattress by taking a far bite 1 cm above or below the previous bite on the other side- near bite on the same side, near bite on the other side, and finally a far bite on the same side. The two ends of the suture were tied to approximate the edges of the linea alba (Figure 1).[3]

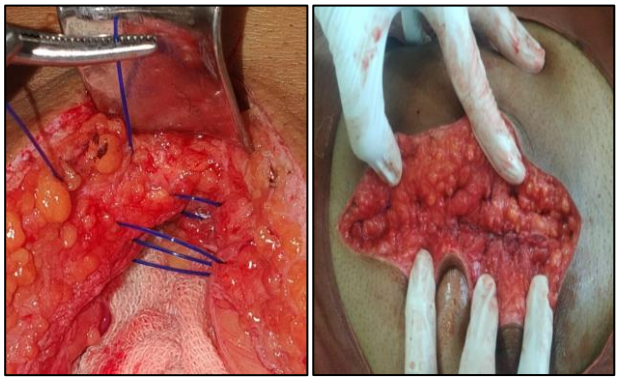

Figure 1: Modified Smead Jones technique.

Continuous closure: It was performed using number 1 polypropylene suture, care being taken to place each bite 1-1.5 cm from the cut edge of linea alba and successive bites being taken 1cm away from each other (Figure 2). The edges of linea alba were gently approximated without strangulation with an attempt to keep a suture to wound length ratio of 4:1.[2]

Figure 2: Continuous suture technique.

Inclusion criteria

Patients aged >18 years and patients who underwent emergency laparotomy through midline incision.

Exclusion criteria

Patients who died within 10 days after surgery; patients who underwent surgery other than midline incisions; and patients who undergone previous laparotomy or re-laparotomy.

Methodology

Total of 100 patients were randomized into two groups: group A and group B with each group having 50 patients.

Group A: Linea alba was closed with Modified Smead Jones technique using a polypropylene 1 number with Far-near near-far technique.

Group B: Linea alba was closed with conventional continuous technique using a polypropylene 1 number.

Follow up: All patients were followed up for infection, any discharge from wound and dehiscence or burst abdomen on 7th postoperative day, 15th postoperative day, then monthly up to 6 months and at the end of 12 months.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) software for windows was used for statistical analysis by using Chi square test, calculation of Relative risk, Confidence interval and p value. The results were considered statistically significant at $p<0.05$

RESULTS

Over all 70 patients of colorectal malignancies where;

Age distribution: In this study, patients with age more than 18 years were included. Mean age of patient in group A was 30.88 and group B was 33.7.

Sex distribution: There were 78 males and 22 females who underwent emergency midline laparotomy. This gives a male to female ratio of approximately 3.5:1.

Indication for laparotomy: Most common indication for laparotomy was pre-pyloric/duodenal perforation comprising 52% in group A and 48% in group B. Second common indication was traumatic jejunal/ileal perforation (Table 1).

Table 1: Indication for laparotomy.

Indication for laparotomy	Group A (n=50)	Group B (n=50)
Pre-pyloric/duodenal perforation	26	24
Traumatic jejunal/ileal perforation	12	11
Enteric perforation	06	03
Colon perforation	01	00
Rectal perforation	01	01
Appendicular perforation	02	01
Ileal stricture/band	02	02
Meckle's diverticular band	00	02
Acute intestinal obstruction due to CA left colon	00	02
Intussusception	00	01
Koch's abdomen	00	03

Post-operative outcomes

Wound infection: was found in 12 patients of group A and 28 patients of group B with chi square value of 10.67 and p value of 0.001 and relative risk of 0.47 with 95% CI of 0.27 to 0.75. This was statistically significant.

Wound dehiscence: It was present in 1 patient in group A and 7 patients in group B with chi square value 4.891 and p value of 0.027. Relative risk of wound dehiscence was 0.2347 with 95% CI of 0.0418 to 0.9059. This was also statistically significant.

Reoperation due to dehiscence: There were 2 patients who underwent resuturing with prophylactic retention sutures due to dehiscence in group B and 0 patients underwent reoperation in group A with chi square value of 2.041 and p value was 0.1531. Relative risk of reoperation due to wound dehiscence was 0 with 95% CI of 0.00 to 1.322. This was statistically insignificant.

Incisional hernia: 1 and 6 patients developed incisional hernia during the follow-up in group A and group B respectively with chi square value of 3.840 and p value of 0.05. Relative risk of incisional hernia was 0.27 with 95% CI of 0.048 to 1. This was statistically insignificant (Table 2).

Table 2: Postoperative outcomes.

Post-operative outcomes	Group A (n=50)	Group B (n=50)
Wound infection	12	28
Wound dehiscence	01	07
Reoperation due to dehiscence	00	02
Incisional hernia	01	06

Mean hospital stay: Mean hospital stay in group A was 9.86 days and in group B was 14.68 days with p value of 0.0006 which was statistically significant.

DISCUSSION

Abdominal wound dehiscence or burst abdomen remains a major cause of morbidity and mortality following emergency midline laparotomy. The perioperative mortality and long term morbidity associated with this condition need preventive measures to be taken as wound dehiscence is a devastating incident that can cause pain, mental distress, infections and related complications, and financial burdens for the patient, as well as complications including evisceration and reoperation.[13-15] Wound dehiscence and subsequent incisional hernia, out of all the complication, account for about 0.4-3.5% and 9-19% respectively after laparotomy.[11,12] In elective setting, the choice of method of closure may not be very important as patient is having adequate nutritional status and no other risk factor for burst and are well prepared for surgery. But in developing countries such as India, most of the patients present in emergency setting with one or more risk factors such as prolonged intra-peritoneal sepsis, anemia, hypoalbuminemia, malnutrition etc. Other set of factors which are also important includes size and type of suture material used (monofilament versus polyfilament, absorbable versus non-absorbable, natural versus synthetic) and also the technique of suturing (layered versus mass closure, interrupted and continuous). Hence, it is imperative for us to ascertain the safest method of closure of the abdomen.

Trials from Western countries like Richards et al in their randomized prospective study comparing continuous versus interrupted suture technique for abdominal fascial closure found that in midline incision, dehiscence rate was 2.0% for the continuous group versus 0.9% for the interrupted group.[5] The difference was not statistically significant (p=0.19) and study conducted by Fagniez et al titled "abdominal midline incision closure" a multi-centric randomized prospective trial comparing continuous versus interrupted polyglycolic acid suture found that overall dehiscence rate was 1.6% in continuous suture group versus 2% in the interrupted suture group and have shown no significant difference in the risk of burst in the interrupted versus continuous methods of suturing.[6]

Study of 90 patients conducted by Ahi et al compared continuous versus interrupted-X versus modified smead jones technique of midline laparotomy wound closure.[2] Eleven out of thirty (36.7%) patients in continuous arm developed burst while Four out of thirty (13.3 %) patients in interrupted-X arm and four out of thirty (13.3%) patients in modified Smead Jones arm developed burst. This study concluded that interrupted suturing was associated with significant reduction in risk of burst when compared with continuous closure technique.

Study conducted by Agrawal et al comparing continuous versus interrupted-X versus modified Smead Jones technique of midline laparotomy wound closure in surgical and gynecological patients also found that interrupted suturing was associated with significant reduction in risk of burst abdomen in comparison to continuous closure technique.[3]

This study has compare the effectiveness of modified Smead Jones technique and conventional continuous technique for fascial closure in emergency midline laparotomy in high risk cases in terms of wound infection, wound dehiscence, reoperation due to dehiscence and incisional hernia.

In our study, a statistically significant difference in the risk of wound infection and wound dehiscence was obtained between modified Smead Jones and conventional continuous method of suturing. However, there was no significant difference found between two methods in terms of reoperation due to dehiscence and incisional hernia. Modified Smead Jones method also decreases mean hospital stay in comparison to conventional continuous closure.

CONCLUSION

Emergency laparotomy requires special care of wound closure. Modified Smead Jones technique is better than conventional continuous technique in management of midline laparotomy closure with respect to wound infection and wound dehiscence.

Recommendations

Study should be performed with large sample size to obtain better results.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Aghara CB, Rajyaguru AM, Bhatt JG. Prospective comparative study of modified Smead Jones versus conventional continuous method of fascial closure in emergency midline laparotomy. Int Surg J 2020;7:3713-7.