Study of Two Techniques for Midline Laparotomy Fascial Wound Closure

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Abstract To study the results of two techniques, simple interrupted closure and continuous with intermittent Aberdeen knot technique for midline laparotomy fascial wound closure. A random selection of 200 midline laparotomy cases was done. In one group (group A) of 100 cases, midline fascial wound closure was done with continuous sutures with intermittent Aberdeen knot technique using Prolene No. 1 suture material. In the other group (group B) of 100 cases, closure was done with the technique of simple interrupted sutures with Prolene No.1 suture material. Comparison of both the techniques regarding preoperative status and postoperative complication such as incisional hernia, wound dehiscence, suture sinus formation, stitch granuloma, and chronic wound pain was done according to clinical examination and recorded in the pro forma prepared. In group A, postoperative complications were incisional hernia 3 %, wound dehiscence 4 %, and suture sinus formation 1 %. In group B, postoperative complication were incisional hernia 5 %, wound dehiscence 4 %, and suture sinus formation 1 %. All these complications were statistically insignificant, in both group comparisons. While the complication such as stitch granuloma 3 %, chronic wound pain 3 %, and wound infection 4 % in group A was

significantly less than in group B where the complication of stitch granuloma was 12 %, chronic wound pain 13 %, and wound infection 13 % (P value 0.03, P value 0.018, and P value 0.048, respectively). Both the techniques, simple interrupted suture closure and continuous with intermittent Aberdeen knot closure for midline laparotomy fascial wounds, show a similar rate of postoperative complication such as incisional hernia, wound dehiscence, and suture sinus formation. But the continuous suturing with intermittent Aberdeen knot technique is a better option to prevent complications such as stitch granuloma, chronic wound pain, and wound infection, which are higher in the simple interrupted fascial wound closure technique.

Keywords Midline laparotomy · Fascial wound closure · Suturing technique

Introduction

The wound is simply a disruption of the normal continuity of tissue. When tissue has been disrupted severely that it cannot heal naturally (without complications or possible disfiguration), it must be held in opposition until the healing process provides the wound with sufficient strength to withstand stress without mechanical support [1].

The wound failure (dehiscence and ventral hernia) and other postoperative wound complications may result from an improper choice of suture material and improper technique. The incidence of incisional hernia varies from 9 to 19 % [2]. The ideal technique and suture material for wound closure is yet to be decided. Closure technique involves a choice of continuous versus interrupted suture, the size of fascia bites, distance between consecutive sutures (stitch interval), the length and size of the suture used [3, 4]. Here,

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we have tried to highlight our result of two different techniques of abdominal fascial closure—simple interrupted suture and continuous with intermittent Aberdeen knot [5]—by using nonabsorbable polypropylene suture material in midline laparotomies.

Material and Methods

This is a comparative randomized study carried out in our department of general surgery. The duration of the study was of 3 years (August 2004 to December 2005). A series of 200 patients presenting in the general surgical OPD and in emergency surgical departments requiring midline laparotomies were studied. Patients were randomized according to the randomization table.

Inclusion Criterion

- Both male and female patients.
- Patients older than 12 years.
- The study included both emergency and elective laparotomies.
- Only continuous with interrupted Aberdeen knot and interrupted technique were used.
- Only vertical midline abdominal incision closures were included.

Exclusion Criterion

- Patients with pre- or postoperative diagnosis of malignant involvement of peritoneum.
- Patients in whom there was a preexisting cause of raised intra-abdominal pressure.
- Ascites.

Procedure

A total 200 patients were selected and divided randomly into two groups: A and B. In group A, all the midline abdominal wounds were closed with Prolene No. 1 suture, with continuous suturing with intermittent Aberdeen knot at every fourth bite of stitch. In group B, simple interrupted stitches with Prolene No. 1 suture were taken. In both techniques, we used suture bites 2 cm apart and 2 cm from fascial edges. In both techniques, the peritoneum was left unsutured and only rectus sheath was closed. In both the groups, the data were collected on clinical examination and recorded in the pro forma prepared, based on postoperative wound complications including postoperative incisional hernia, wound dehiscence, suture sinus formation, stitch granuloma, chronic wound pain, and wound infection. Patients were followed up at 1 week, 2 weeks, and then 1, 3, 6, and 12 months postoperatively.

Data Collection Technique

The data were collected directly from the patient in the form of history and clinical examination. The follow-up and documentation of postoperative wound complications were done according to the pro forma.

Result

Between January 2006 and December 2008, 200 patients were enrolled. These patients were then randomized into two groups: group A and group B. In group A, 100 patients (50.0 %), the operative fascial wounds were closed with non absorbable suture (Prolene-1) with technique of continuous suturing with intermittent Aberdeen knot, and in Group-B, 100 patients (50.0 %), operative fascial wounds were closed with nonabsorbable suture (Prolene-1) with simple interrupted sutures.

Table 1 shows the comparative data in the two groups, with regard to the preoperative condition of the patients. In group A, 89 % were male and 11 % female; 20 % elective surgery, 80 % emergency surgery, 19 % clean, and 71 % contaminated surgery were done. In Group B, 85 % were male and 15 % female; 14 % elective surgery, 86 % emergency surgery, 13 % clean, and 87 % contaminated surgery were done.

All postoperative complications were then compared between the two groups. Our results show that the postoperative complications of incisional hernia (chi-square 0.13, *P* value 0.71), development of wound dehiscence (chi-square 0.00, *P* value 1.0), and suture sinus formation (chi-square 0.00, *P* value 1.0) are statistically insignificant between group A and group B. But complications such as stitch granuloma (chi-square 4.61, *P* value 0.03), chronic wound pain (chi-square 5.5, *P* value 0.018), and wound infection (chi-square 3.91, *P* value 0.048) are significant as *P* value is less than 0.05, where these complications are less in group A and continuous suturing with intermittent Aberdeen knot technique was used. The comparison of the two groups with postoperative complications is shown in Table 2. In Group A, we found 1 case of incisional hernia at the fifth month

Table 1 Comparison of preoperative condition

Preoperative condition	Group A (<i>n</i> =100)	Group B (<i>n</i> =100)
Male	89 %	85 %
Female	11 %	15 %
Elective surgery	20 %	14 %
Emergency surgery	80 %	86 %
Clean surgery	19 %	13 %
Contaminated surgery	81 %	87 %

Table 2 Comparison of postoperative complication

Complication	Total N=200 (%)	Group A N=100 (%)	Group B N=100 (%)	Chi-square (<i>P</i> value)
Incisional hernia	8 (4 %)	3 (3 %)	5 (5 %)	0.13 (0.71)
Wound dehiscence	8 (4 %)	4 (4 %)	4 (4 %)	0.00 (1.0)
Suture sinus formation	2 (1 %)	1 (1 %)	1 (1 %)	0.00 (1.0)
Stitch granuloma	15 (7.5 %)	3 (3 %)	12 (12 %)	4.61 (0.03)
Chronic wound pain	16 (8 %)	3 (3 %)	13 (13 %)	5.5 (0.018)
Wound infection	21 (11.5 %)	4 (4 %)	13 (13 %)	3.91 (0.048)

and 2 cases at the seventh month of follow-up. In Group B, we found 2 cases of incisional hernia at the third month and 2 cases at the ninth month of follow-up.

Discussion

In both groups, more males had undergone laparotomy in comparison to females because certain diseases such as peptic perforation, enteric perforation, and some malignancy are more common in males due to bad habits, life style, and genetic reasons. In both groups, more emergency and contaminated cases were done with midline laparotomies in comparison to elective and clean surgery because in most elective cases laparoscopic surgery is a better option than conventional laparotomy.

Simple interrupted suture (SIS) is a traditionally used technique for closure of laparotomy fascial wounds. The disadvantages of SIS are the greater amount of suture material used, and overall increased time in tying and cutting numerous knots. Suture material contained in SIS is mostly in the form of knots which make that part of the tissue subject to foreign body reaction and wound infection. But the advantage of this technique is that even if there is infection or cut through of one stitch, it prevents the opening of the whole wound. Continuous suturing with intermittent Aberdeen knot credits enhanced wound strength, which keeps the incision edges in close approximation. The advantages of this technique are speed, an equal distribution of tension, prevention of purse string effect, less foreign material in the wound, and less wound trauma [3, 4].

The wound dehiscence means premature bursting, open or splitting along natural or surgical suture lines, occurs secondary to poor wound healing. Risk factors include diabetes, advanced age, obesity, and trauma during the postsurgical period [6]. Incisional hernia and wound dehiscence are one of the most notorious complications after laparotomy, and they account for about 9–19 % and 0.25–3 %, respectively, following laparotomy [3, 6]. Other common postoperative complications are suture sinus formation [7], stitch granuloma

[8], and chronic wound pain [7]. The total incidence of incisional hernia in our study is only 4 % which is quite low compared to other studies. This is because we have maintained the common principle of suturing in both techniques of facial wound closure. This principle is to take suture bite 2 cm away from sheath margin and 2 cm apart from each other. With this technical help, we are able to maintain low rate of complication such as incisional hernia and wound dehiscence [9].

The other complication such as stitch granuloma ($P=0.03$), chronic wound pain ($P=0.018$), and wound infection ($P=0.048$) is significantly high in technique of interrupted suturing in comparison to continuous with interrupted Aberdeen knot technique for facial wound closure ($P<0.05$). This is because more suture material and knotting are used in simple interrupted technique and this gives more inflammatory reaction.

The ideal technique for closing abdominal fascia has yet to be determined. Various randomized controlled trials of abdominal fascial closure have failed to determine the best technique and the ideal suture. Results were often conflicting and have left many surgeons uncertain about the technique for abdominal fascial closure. In this study we got better results, in terms of lower complication rates with continuous suturing and intermittent Aberdeen knot technique for fascial closure in both emergency and elective midline laparotomies. This is initial research and we recommended long-term follow-up.

Conclusion

Both the techniques, simple interrupted suture closure and continuous with intermittent Aberdeen knot closure for midline laparotomy fascial wounds, show a similar rate of postoperative complication such as incisional hernia, wound dehiscence, and suture sinus formation. But the continuous suturing with intermittent Aberdeen knot technique is a better option to prevent complications such as stitch granuloma, chronic wound pain, and wound infection which are higher in the simple interrupted fascial wound closure technique.

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