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Original Research Article

Interrupted Abdominal Fascial Closure: Comparison of Nonabsorbable (Polyamide) Versus Delayed Absorbable (Polydioxanone) Sutures Used in Cases of Peritonitis

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ABSTRACT

Background: The suture material used plays a significant role in the healing of laparotomy wounds. Despite progress in the techniques of surgery, there is still a lot of controversy about selection of the best technique and suture material for rectus sheath repair in cases of peritonitis. Current study was done using interrupted technique to compare non-absorbable (POLYAMIDE) sutures and delayed absorbable (POLYDIOXANONE) sutures for abdominal fascial closure in cases of peritonitis.

Material and Methods: The study was conducted in sixty patients of peritonitis divided into two groups (A and B). Group A consisted of 30 patients who had undergone interrupted closure of abdominal fascia with polyamide (Nylon) No. 1 suture, and Group B comprised of 30 patients who had undergone interrupted closure of abdominal fascia using polydioxanone (PDS) No.1 suture. The wound was inspected postoperatively for the development of wound complications like wound infection, wound pain, sinus formation, wound dehiscence and incisional hernia.

Results: Wound infection rate was found to be (6/30) 20% in Nylon group as compared to (7/30) 23.3% in PDS group. However, this difference was found to be statistically insignificant because of the fact that both the sutures were monofilament used in our study. Wound pain rate was found to be (7/30) 23.3% in Nylon group as compared to (2/30) 6.7% in PDS group (p value – 0.1481). Suture sinus rate was found to be (3/30)10% in Nylon group as compared to (0/30) 0% in PDS group (p value – 0.2361). Evaluating patients in two groups, wound dehiscence and incisional hernia has not occurred in any of the groups.

Conclusion: The present study demonstrated an advantage of delayed absorbable (POLYDIOXANONE) suture over non-absorbable (POLYAMIDE) because it is comparable to non-absorbable suture in terms of wound dehiscence and incisional hernia with much less incidence of wound pain and sinus formation.

Key words: Polyamide, Polydioxanone, Interrupted Abdominal Fascial Closure, Peritonitis.

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INTRODUCTION

As, Midline laparotomy is simple and provides adequate exposure to all four quadrants, and also affords quick exposure with minimal blood loss, so, it is the most common technique of abdominal incisions in both emergency and elective settings.[1]

It is however possible to influence the technique of wound closure and the material used, despite the number of factors which contribute to the healing of surgical wound at the time of operation, cannot be influenced.[2]

The suture material used plays its own significant role in the healing of laparotomy wounds apart from other factors like infection, site of incision, method of closure and stress and strain in the post-operative period. Absorbable sutures may be natural (catgut) or synthetic (polydiaxonone). Similarly, non-absorbable sutures may be natural (silk, cotton and linen) or synthetic (nylon, polypropylene and polyesters etc).

Polydioxanone suture (PDO or PDS) or poly-p-diaxonone is a colorless, crystalline and biodegradable polymer composed of polyester poly (p-diaxonone).

Distinctive characteristics of polydioxanone sutures:

- Minimal tissue reaction, non-antigenic, non-pyrogenic, does not support infection.
- Absorbed slowly over a period of 6 to 7 months, thus providing wound support for longer periods.
- Smooth, pliable and minimal memory.

Polyamide is a polymer containing monomers of amides joined by peptide bonds with distinctive characteristics:

- Non absorbable
- Good tensile strength and knot security
- Elicit minimal inflammatory reaction in tissues

Despite progress in the techniques of surgery, there is still a lot of controversy about the selection of the best technique and suture material for rectus sheath repair in cases of peritonitis. Some surgeons favor non-absorbable sutures while others use absorbable materials, but there is little objective clinical information regarding the relative merits of different suture materials.

Some surgeons prefer to do continuous closure of abdominal fascia in emergency and elective settings[3], while others preferred interrupted suture over continuous because they found that in a continuous suturing cutting out of even a single bite of tissue leads to opening of the entire wound and they found much lower risk of burst abdomen with interrupted method of closure,[4] while still others found no significant difference in continuous and interrupted methods of closure.[5] The type of closure may not be so important in elective patients who are nutritionally adequate, do not have risk factors for dehiscence and are well prepared for surgery. However, it may prove crucial in emergency patients especially with peritonitis who often have multiple risk factors for developing dehiscence.[6] In this study, we hope to shed some light on this debatable topic, using interrupted technique in all cases to compare non-absorbable sutures and delayed absorbable sutures for abdominal fascial closure in cases of peritonitis.

AIMS AND OBJECTIVES

To compare non-absorbable sutures and delayed absorbable sutures for abdominal fascial closure in cases of peritonitis.

MATERIALS AND METHODS

The study was conducted in the department of the General Surgery, Rajindra Hospital, Patiala. The study had included 60 patients of peritonitis who were divided into two groups (A and B) randomly. Group A consisted of 30 patients who had undergone interrupted closure of abdominal fascia with polyamide (Nylon) no. 1 suture (Fig 1), and Group B comprised of 30 patients who had undergone interrupted closure of abdominal fascia using polydioxanone (PDS) no.1 suture (Fig 2).

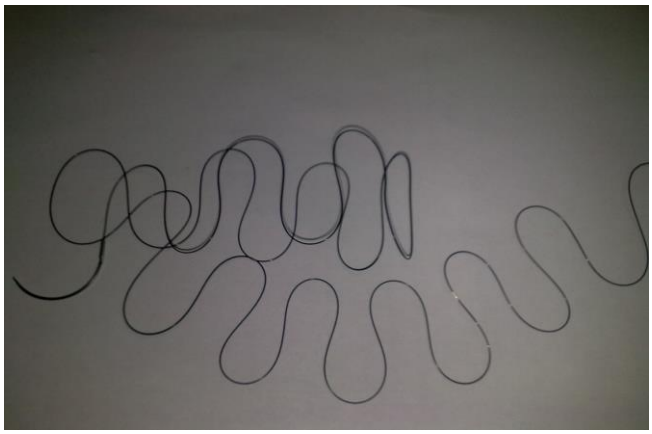

Figure 1: Polyamide Suture Used In Group A Patients For Closing Of Abdominal Fascia

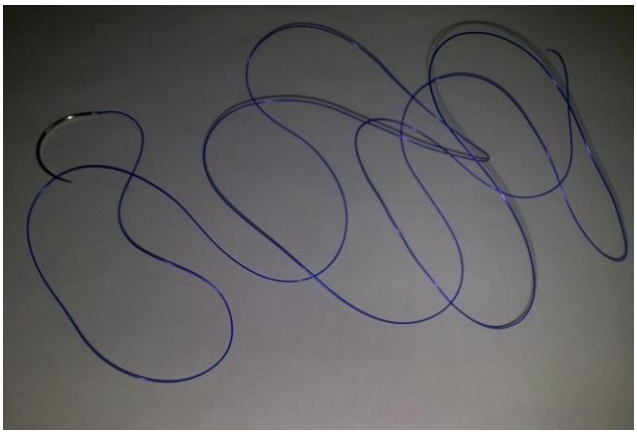

Figure 2: Polydioxanone Suture Used In Group B Patients For Closing Of Abdominal Fascia

Figure 3: Midline Incision before Closing of Abdominal Fascia

Figure 4: Midline Incision after Closing of Abdominal Fascia

Patients with severe renal and liver disease, uncontrolled diabetes, patients on chemotherapy or steroids were excluded from the study. All the patients included in the study had undergone detailed history, physical examination, routine blood investigations and radiological investigations (X-ray abdomen erect, chest X-ray, USG abdomen). All patients were given pre-operative dose of antibiotics (ceftriaxone, gentamycin and metronidazole) which were continued in the post-operative period also. Exploratory laparotomy was carried out through a midline vertical incision (Fig 3). After the correction of primary cause, thorough examination and peritoneal lavage was done. The required abdominal fascial closure was done accordingly (Fig 4).

In Group A: Non-absorbable monofilament No.1 polyamide (nylon) was used in an interrupted figure of eight manner taking 4-5 squared knots in a single suture tie. The bites were taken 1.5 cm away from the cut margin and at a distance of 1 cm between each other. Each knot was buried.

In Group B: Delayed absorbable monofilament No.1 polydioxanone (PDS) was used in a similar interrupted manner. The wound was inspected for signs of infection and dehiscence at 15 days, 1st, 2nd and 3rd months post-operatively for the development of wound complications.

At the end of study the two groups were compared regarding:

1) Wound infection
2) Wound dehiscence
3) Wound pain
4) Sinus formation
5) Incisional hernia

Table 1: Prevalence of Complications in Two Groups

Complication	Group A	Group B	P Value
Wound infection	6(20%)	7(23.3%)	0.7540
Wound Pain	7(23.3%)	2(6.7%)	0.1481
Suture sinus	3(10%)	0(0%)	0.2361
Wound dehiscence	0(0%)	0(0%)	NS
Incisional hernia	0(0%)	0(0%)	NS

RESULTS

All the patients included in the study had undergone detailed history and examination. Midline Laparotomy was performed and patients were followed up post-operatively for the development of wound complications. Maximum incidence of peritonitis was found in 3rd and 4th decade of life (31/60 or 51.7 %) and minimum incidence was present in 1st and beyond the 8th decade of life each (2/60 or 3.3 %). The mean age in our study was 34.15 years (range - 7.5 to 70). Majority of patients in our study (52/60 or 86.7 %) were males. Male to female ratio in our study was 6.5:1. The heavy preponderance of males could be due to more use of intoxication like alcohol, smoking, irregular meals, more outdoor life and eating spicy foods. All of them contribute to small bowel pathologies. Pain abdomen, vomiting, distention abdomen and altered bowel habit were the commonest presenting complaints in cases of peritonitis. Most common site of perforation was of ileal perforation (21/60 or 35%) in both groups, followed by duodenal (15/60 or 25%) and gastric (7/60 or 11.7%) perforation. Peptic ulcer (22/60 or 36.7%) was the most common cause of perforation peritonitis followed by enteric fever (20/60 or 33.3%). Typhoid ulcers were more common in 20 - 39 yrs of age group while and peptic ulcer perforation were more commonly found in 20 - 49 yr of age group.

Wound infection rate was found to be (6/30) 20% in Nylon group as compared to (7/30) 23.3% in PDS group. However, this difference was found to be statistically insignificant because both the sutures were monofilament used in our study (p-value = 0.7540). (Table 1)

Wound pain rate was found to be (7/30) 23.3% in Nylon group as compared to (2/30) 6.7% in PDS group. However, this difference was found to be statistically insignificant (p-value =0.1481). Suture sinus rate was found to be (3/30)10% in Nylon group as compared to (0/30) 0% in PDS group (P-value = 0.2361). Wound dehiscence and incisional hernia has not occurred in any of the groups. (Table 1)

Co-morbidities did not found to increase the incidence of wound complications. The mean duration of hospital stay while using Nylon was 17.43 days as compared to 17.96 days for PDS suturing.

DISCUSSION

The best method and best suture of abdominal closure is one that maintains tensile strength throughout the healing process with good tissue approximation, does not promote wound infection or inflammation, is well tolerated by patients and is technically simple and expedient. The mean age of the patients was 36.8 ± 15.22 and 31.51 ± 17.13 years respectively in group A and B. Jhobta and associates from Chandigarh done a study on cases of perforation peritonitis and mean age was 36.8 years in their study.[7] Majority of the patients were males (52/60; 86.7%). Male to female ratio in our study was 6.5:1. Two groups were comparable in terms of sex distribution. The heavy preponderance of males could be due to more use of intoxication like alcohol, smoking, irregular meals, more outdoor life and eating spicy foods. All of them contribute to small bowel pathologies.

Pain abdomen, abdominal distention, vomiting and altered bowel habit were the commonest presenting complaints in cases of peritonitis. Most common site of perforation was ileum with 21 patients followed by duodenum in 15 patients and stomach in 7 patients. Afridi and associates reported same results in their study (Duodenum 43.6%, ileum 37.6, jejunum 3.3% and stomach 2.3%).[8] Peptic ulcer (22 or 36.7%) was the most common cause of perforation peritonitis followed by enteric fever (20 or 33.3%). Jhobta and associates from Chandigarh done a study on 504 cases of perforation peritonitis and found that most common cause of perforation was acid peptic disease in 297(58.9%) of patients.[7] Wound infection rates in the two groups were (6/30) 20% and (7/30) 23.3% respectively, which was found statistically non-significant (p-value without Yates' correction = 0.7540). The wound infection was not found to be statistically affected by the suture material employed because both the sutures were monofilament used in present study and both having minimal tissue reaction.

In the current study wound dehiscence had not occurred in any of the patient in any of the group. Delayed absorbable suture is comparable to non-absorbable suture in terms of wound dehiscence because PDS sutures loose half of their mechanical strength in about three weeks, thus providing wound support for longer periods.

Krukowski and associates conducted a prospective comparative clinical trial in 1987 in seven hundred and fifty-seven consecutive patients undergoing a midline abdominal incision and reported that there was one wound dehiscence in each group.[8]

Wound pain rate was found to be (7/30) 23.3% as compared to (2/30) 6.7% in PDS group. Which was found statistically non-significant (p-value with Yates' correction =0.1481). Van't and associates reported that more wound pain (P < 0.005) occurred after the use of non-absorbable suture.[9] Wound pain occurred more frequently with Nylon suture because of its long memory, more tissue reaction and stiff nature. Wound pain occurred less frequently with the use of PDS because it has been found to be smooth, pliable, minimal memory, non-antigenic, non-pyrogenic and elicits only minimal tissue reactivity during the absorption process.

Sinus formation rate was found to be (3/30) 10% as compared to (0/30) 0% in PDS group (p-value with Yates' correction = 0.2361). However, this difference was found to be statistically insignificant. Wissing and associates compared four techniques with different sutures and reported that suture sinuses developed in 3.5 per cent of all patients and occurred more frequently in the nylon group (7.7 per cent), which is statistically significant.[10] Present study also obtained the similar results. Non-absorbable (Nylon) sutures are associated with more sinus formation than delayed absorbable (PDS) sutures because of their long memory and stiff nature. Sinus formation occurred less frequently with the use of delayed absorbable (PDS) because it has been found to be smooth, pliable and minimal memory.

Incisional hernia has not occurred in any of the group in our study. Israelsson and Jonsson evaluated the healing of midline laparotomy incisions closed with nylon or second-generation polydioxanone in a randomized clinical trial in 1997. Incisional hernia 12 months after surgery was found in 49 (15.1 per cent) of 325 wounds sutured with polydioxanone and in 50 (15.7 per cent) of 318 closed with nylon (P = 0.91). These results indicate that suture of midline laparotomy wounds is as safe with polydioxanone as it is with nylon.[11] Present study also showed same results but we have 0% hernia rate in both the groups, this was probably due to interrupted technique of fascia closure, Formerly it was thought that hernia incidence are more with absorbable sutures, but recent studies reported that delayed absorbable and non-absorbable sutures are comparable in terms of incisional hernia incidence because PDS sutures loose half of their mechanical strength in about three weeks and complete degradation takes place in around six months, thus providing wound support for longer periods and reduces the chances of hernia formation.

The mean duration of hospital stay while using Nylon was 17.43±7.18 days as compared to 17.96±10.23 days for PDS suturing. The duration of hospital stay was similar in both the suture material because none of them have significantly more wound complications.

SUMMARY AND CONCLUSIONS

The best suture of abdominal wound closure should provide adequate tensile strength, does not inhibit wound healing, does not promote wound complications, and is well tolerated by patients. The most important factors in preventing wound complications are suture material and surgical technique. Trials have not shown any significant difference in the complication rates between the two sutures. However, an in-depth review of the literature and our own personal data demonstrated an advantage of delayed absorbable suture over non-absorbable because it is comparable to non-absorbable suture in terms of wound dehiscence and incisional hernia with much less incidence of wound pain and sinus formation.

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