

Comparing Complications between Polydioxanone and Polypropylene Sutures during Midline Laparotomy Procedures: Randomized Control Trial

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ABSTRACT

Background: Currently there is no consensus on the superiority of either absorbable or non-absorbable suture materials for abdominal fascial closure.

Aim: To determine the superior suture material for abdominal wall closure after surgery among polypropylene and polydioxanone based on the occurrence of post-operative wound infection and pain. It was a randomized controlled trial.

Methodology: In current study sample size calculated was 188. Subjects were divided into group-A (n=94) and group-B (n=94). In group-A, incisional wound was closed by polydioxanone suture whereas in group-B, incisional wound was closed by polypropylene suture.

Results: The mean±SD age of all enrolled patients in group-A was 45.8±14.6 years. There was significant difference between groups with *p*-value 0.007 in terms of Postoperative wound infection whereas insignificant difference was seen in terms of Postoperative wound pain. All the data was processed by using SPSS v 23.0. Chi square was used to determine the association of postoperative wound infection and pain with sutures.

Conclusion: We concluded that development of wound infection post-operatively was high among patients sutured with polypropylene as compared to polydioxanone group. However, there was no difference among both groups in terms of post-operative pain.

Keywords: Midline incisional laprotomy, Post-operative wound infection, Sutures and Pain.

INTRODUCTION

The most common procedure in general surgery is midline incisional laprotomy. Material employed for wound closure effects post-surgical outcomes including complications. Closing of wound incisions is commonly done by either absorbable (Polydioxanone) or non-absorbable (Polypropylene) sutures^{1,2}.

Complications related with its wound closure due to different sutures used today include post-operative pain, wound infection, scar formation and burst abdomen. They are the major causes of deaths among surgically treated patients in our setups as well as globally. Most common complication of abdominal surgical procedure is the development of incisional hernia with a documented incidence of 3-13% of patients following laparotomy while wound infection and pain are secondary complications³.

Few studies estimated the number of laparotomies with development of incisional hernias worldwide. It has been reported that in the US, 4-5 million laparotomies are done per year. Around 10-15% midline abdominal laparotomies end up in development of wound site infection or pain of various category in US⁴⁻⁶. Thus approximately 4% patients having laparotomy require additional re-opening of wound in-order to find the cause of infection. Wound infection adds not only morbidity but also the tremendous costs to the patients and prolongs his stay at the hospital. There is no best, safe and established technique for closing the midline abdominal wound after laparotomy generally without the development of post-operative complications⁷.

Effective preventive treatment options for reducing the development of post operative wound infection is the need of hour due to huge work load of midline incisional laprotomies in our tertiary healthcare setups^{8,9}. In our country, due to less registered data available regarding deaths due to surgical complications, we conducted this study to determine the superior suture material for abdominal wall closure after surgery among polydioxanone and polypropylene based on the occurrence of post-operative wound infection and pain.

METHODOLOGY

A sample of 188 patients (94 per group) was required to have a 90% power of study to detect the difference between both groups in the current study from March-August 2020 in the Department of General Surgery, Allama Iqbal Memorial Teaching Hospital, Sialkot following hospital's ethical committee approval. The study design was randomized controlled trial. Only patients fulfilling the inclusion criteria i.e acute as well as chronic abdominal pain, both genders (16-70years) were enrolled. In group-A, incisional wound was closed by polydioxanone suture whereas in group-B, was done by polypropylene suture respectively¹⁰.

Statistical Analysis: Frequency and percentages were given for age groups, gender, operation contamination, pain and postoperative wound infection. Chi square was used to determine the association of postoperative development of wound infection and pain with sutures among two groups by using SPSS v23.0. A *p*-value ≤ 0.05 was considered significant.

RESULTS

Patients (n=188) were equally distributed in two groups i.e., poly-dioxanone suture and polypropylene suture. Baseline characteristics among enrolled subjects were shown in table-1. Chi square test was used to compare the post-operative wound infection and pain between both groups. 27(28.7%) patients in the group-A developed a postoperative wound infection and 45(47.9%) patients in group-B developed a wound infection. This difference was found to be statistically significant with p-value of 0.007.

Table-1: Baseline characteristics distribution between groups (n=188)

Genders	Polydioxanone Group (n=94)	Polypropylene Group (n=94)	Total
Males	52 (55.30%)	49 (51.13%)	101(53.70%)
Females	42(44.70%)	45 (47.90%)	87(46.30%)
Operative contamination			
Clean	70 (74.5%)	72 (76.6%)	142(75.53%)
Contaminated	07 (7.4%)	8 (8.5%)	15(7.9%)
Dirty	17 (18.1%)	14 (14.9%)	31(16.48%)
16-50 years	44 (46.8%)	46 (48.9%)	90 (47.90%)
51-70 years	50 (53.2%)	48 (51.1%)	98 (52.10%)
Age(mean±SD)	45.8 ± 14.6 years		

Table-2: Development of complications between Group-A and Group-B

Postoperative wound infection	Group-A (n=94)	Group-B (n=94)	p-value
Yes	27 (28.7%)	45 (47.9%)	0.007*
No	67 (71.3%)	49 (52.1%)	
No pain	38 (44.4%)	34 (36.2%)	0.265
Mild	16 (17.0%)	13 (13.8%)	
Moderate	26 (27.7%)	22 (23.4%)	
Severe	14 (14.9%)	25 (26.6%)	

*statistically significant

DISCUSSION

Through this study, an attempt was made to study the development of complications like post-operative wound infection and pain among enrolled patients (n=188) undergoing midline incisional laparotomies due to difference in material used among groups. This study suggested that there is a significant improvement in outcomes in group-A treated with polydioxanone.

In our current project, sample size was 188 patients when compared with other study where sample size practiced was 200 patients undergoing both elective as well as emergency surgical procedures¹⁰. In contrast, one study carried in 2017 at Federal Government Services Hospital, Islamabad included 620 patients for midline incisional laprotomies in their study¹¹. In our study, both male and female patients were voluntarily enrolled. Males were 101(53.70%) while females were 87(46.30%) in present project. In other study, patients for midline incisional laprotomies included 333(53.7%) men and 287(46.3%) females. Males dominated in both studies. Hence, our work was in line with previous studies¹¹.

In current project, 27(28.7%) patients in group-A developed post-operative wound infection whereas 45(47.9%) patients in group-B had it with p-value of 0.007. Our results were in line with one study carried in 2017 at Federal Government Services Hospital, Islamabad whoshowed that development of post-operative wound infection with polydioxanone suture was 33.9% whereas 67.1% patients developed it when treated with polypropylene suture in their study¹¹. Paradoxically, one

study showed that 14 participants (6.3%) developed surgical-site infection in polypropylene treated group whereas 18 patients (7.7%) reported it in polydioxanone group in their study¹².

In present study, 56(55.6%) patients had mild to severe pain in group-A while 60(63.8%) patients had mild to severe pain in group-B as per table-2. This difference was insignificant having p-value of 0.265. Our results were in line with one previous study that showed in midline abdominal closure with PDS, there was decreased post-operative wound pain as compared to abdominal wound closure with Prolene¹¹.

CONCLUSION

We concluded that development of wound infection post-operatively was high among patients sutured with polypropylene as compared to polydioxanone group. However, there was no difference among both groups in terms of post-operative pain. Limited data is available locally that compared clinical complications due to different sutures hence this study can prove helpfull in making suture selection during surgeries in terms of complications development.

Limitations: We admit that our study had a number of limitations. It included small sample size, single trial centre and financial constrains with lack of resources.

Strengths: Comparison was made between absorbable (Polydioxanone) and non-absorbable (Polypropylene) sutures in-order to see the better outcomes in terms of complication due to difference in material used among groups.

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