Original Article

Postoperative Wound Infection After Midline Abdominal Incisions

Postoperative Wound Infection

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ABSTRACT

Objectives: The objective of this study was to compare postoperative wound infection rate after abdominal closure with Polydioxanone and prolene for midline incisions.

Study Design: Randomized control trial

Place and Duration of Study: This study was conducted at the department of Surgery Sheikh Khalifa Bin Zaid Hospital Rawlakot Azad Kashmir from 09-05-2013 to 28-05-2015.

Materials and Methods: Total of 106 patients undergoing elective and emergency laparotomies. In this randomized control trial conducted at Sheikh Khalifa Bin Zaid Al Nahyan Hospital Rawlakot Azad Kashmir Department Of Surgery, we studied 106 patients for midline closure of abdominal surgery. We made two groups (Group A consisted patients who underwent abdominal closure with Polydioxanone no. 1 and Group B contained patients who underwent closure with Prolene no. 1). The outcome variable was wound infection.

Results: The average age of 106 patients was 36.88 ± 13.28 years with range 14-49 years. Statistically the post operative wound infection was present in 25 (23.6%) patients, in which 7 (6.6%) were from group A and 18 (18%) were from group B. The percentage of wound infection was statically higher in group B as compared to group A (p-value < 0.05).

Conclusion: Polydioxanone is inert in tissues if we compare it with other absorbable materials. According to our experience, Polydioxanone causes less wound infection as compared to Prolene in midline abdominal wound closure.

Key Words: Abdominal closures, Midline surgery and wound infection

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INTRODUCTION

Abdominal wound closure often reflects a surgeon's personal preference. The importance of suture material may be accessed by wound complications. Early complications include wound dehiscence and infection.[1] Chances of infection are less with non-absorbable sutures[2-5]. Examples of such materials are polypropylene, nylon, polyethylene, and polyamide[6]. Braided silk have a high association with infection, and an intense inflammatory reaction.[7-9]

Wound infection remains the most significant early postoperative complication in 3 to 21% of patients undergoing midline laparotomy.[10,11] The choice of material for abdominal closure should be made in the light of what is known about resistance to infection. Non-absorbable materials (e.g., polypropylene) are associated with high incidence of wound pain and sinus formation.[1]

Absorbable materials are designed to approximate the fascia during the critical early healing period and subsequently to undergo absorption to avoid these complications associated with non-absorbable sutures. Polydioxanone (PDS) and polyglyconate (Maxon) are the most commonly used slowly absorbable suture materials. On review of a meta-analysis, absorbable monofilament suture material was found superior in comparison with non-absorbable monofilament.[1] Most authors suggest that a slowly absorbable monofilament suture material is superior to a non-absorbable suture material for closure of the abdominal wall, and that there is no standard technique generally accepted as best or rather safest for closing the abdominal wall after primary midline laparotomy.[10] This study aims to compare two suture materials, polydioxanone and polypropylene, in closure of midline laparotomy wounds in order to find a better choice of suture material in terms of wound infection.

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MATERIALS AND METHODS

This randomized control trial study was conducted at the department of Surgery Sheikh Khalifa Bin Zaid Hospital Rawlakot Azad Kashmir from 09-05-2013 to 28-05-2015.

Sample Size: Using WHO sample size calculator, where level of significance was 5%, Power of test = 80%, Population proportion (P_1) = 9% and P_2 was 2.3%.

So, sample size (n) = 106

(53 patients in each group A and B, randomly allocated). Group A = Polydioxanone was used in abdominal closure. Group B = Prolene was used in abdominal closure.

Sampling Technique: Non-probability purposive sampling

Sample Selection

Inclusion Criteria:

- All patients undergoing midline laparotomy in elective as well as in emergency operation theatres.
- ASA (American Society of Anesthesiologists) grade I and II.

Exclusion Criteria

- Radiotherapy of the abdomen completed less than 8 weeks before operation.
- Current immunosuppressive therapy.

Data Collection Procedure: All patients who met the inclusion criteria, underwent midline laparotomies in elective as well as in emergency operation theatres of our hospital were selected for the study.

After obtaining approval by the hospital ethical committee, informed written consent was taken from each patient. All midline abdominal wounds were closed by continuous single layer mass closure, and the procedure was performed by a single selected team of surgeons. The patients was randomly allocated either to group A or B (randomization) Lottery method.

Group A: patients who were undergo abdominal closure with Polydioxanone # 1.

Group B: patients who were undergo abdominal closure with Prolene # 1.

Patients in each group were administered preoperative prophylactic intravenous antibiotics covering gram negative organisms and anaerobes. The same intravenous antibiotics along with analgesics was continued postoperatively for at least five days. Postoperative wound infection was assessed immediate postoperatively till 7 days by daily wound examinations. If there was any purulent discharge then it was sent in laboratory for regular examination. Culture and sensitivity of the discharge was only be requested if the white blood cell (WBC) count on regular examination is more than 11,000 cm^3. Abdominal wounds was cleaned by pyodine solution followed by normal saline dressings on daily basis.

Data Analysis: All the data was entered on SPSS for windows version 10. Mean and standard deviation was calculated for quantitative data, i.e., age. Frequencies and percentages was calculated for qualitative data, i.e., results of routine examination (microscopy), results of culture and sensitivity, results of wound infection, suture breaking, knot slipping and intact suture cutting out of the tissues.

Chi-square test was used to compare wound infection in group A and group B. A p-value $\leq$ 0.05 was considered statistically significant.

RESULTS

In this study a total of 106 patients were divided into two groups; Group A contained 53 (50%) in which Polydioxanone was used for abdominal closure and in Group B 53 (50%) patients were taken in which the abdominal closure was done with Prolene.

In Group A the average age of patients was 36.32 ± 13.57 years with minimum and maximum ages 16 years and 65 years respectively. In Group B, the average age was 37.43 ± 13.09 years along with minimum and maximum ages 17 years and 65 years respectively. Hence over all, the average age of 106 patients was 36.88 ± 13.28 years with range of 49 years. Table #1

WBC > 11000 cm^3 was present in 17 (16%) patients in which 6 (5.7%) patients were belonged to group A and 11 (10.4%) in group B. The status of WBC > 11000 cm^3 was statistically same in both groups (p-value > 0.05). Table # 2

Table No. 1: Descriptive statistics of Age (years)

	Polydioxanone	Prolene	Total
Mean	36.32	37.43	36.88
Std. Deviation	13.57	13.09	13.28
Minimum	16	17	16
Maximum	65	65	65

Table No. 2: Frequency Distribution of "WBC > 11000 cm 3" with respect to study groups

		Study Group		Total
		Polydio-xanone	Prolene	
WBC > 11000 cm^3	Present	6 (5.7%)	11 (10.4%)	17 (16%)
	Absent	47 (44.3%)	42(39.6%)	89 (84%)
Total		53 (50.0%)	53(50.0%)	106 (100.0%)

Chi-Square Test = 1.75 p-value = 0.186

Table No. 3: Frequency Distribution of "Culture and Sensitivity of fluid, Organism Isolated" with respect to study groups

		Study Group		Total
		Polydio-xanone	Prolene	
Culture and Sensitivity of fluid, Organism Isolated	Present	4 (3.8%)	6 (5.7%)	10 (9.4%)
	Absent	49 (46.2%%)	47 (44.3%%)	96 (90.6%%)
Total		53 (50.0%)	53(50.0%)	106 (100.0%)

Chi-Square Test = 0.442 p-value = 0.506

According to culture and sensitivity of fluids, Organisms were isolated in 4 (3.8%) patients and 6 (5.7%) patients in group A and group B respectively. In Groups A the cultures sensitivity of fluid, Organism isolation was absent in 49 (46.2%) and in group B it

was absent in 47 (44.3%) of the patients. The culture and sensitivity of fluid, organism isolation was statistically same in both groups (p-value >0.05). Table # 3

Sutures were broken in one patient only in Group A, while in 8(7.5%) patients belonged to group B the suture were broken during follow up. Statistically in group B the breakage of suture were significant (p-value < 0.05). Table #4

Knot slipping was seen only in one patient who belonged to group B. The knot slipping was statistically insignificant (p-value >0.05) in both treatment groups. Table #5

Finally, the post operative wound infection was present in 25 (23.6%) patients, in which 7 (6.6%) were from group A and 18 (18%) were from group B. The percentage of wound infection was statically higher in group B as compared to group A (p-value < 0.05). Table # 6.

Table No. 4: Frequency Distribution of Suture Breaking with respect to study group

		Study Group		
		Polydio-xanone	Prolene	Total
Suture breaking	Present	1 (.9%)	8(7.5%)	9 (8.5%)
	Absent	52 (49.1%)	45(42.5%)	97(91.5%)
Total		53 (50.0%)	53(50.0%)	106 (100.0%)

Chi-Square Test = 5.950 p-value = 0.015

Table No. 5: Frequency Distribution of knot slipping with respect to study group

		Study Group		
		Polydio-xanone	Prolene	Total
Knot slipping	Present	0 (0%)	1 (0.9%)	1 (0.9%)
	Absent	53 (50%)	52 (49.1%	105
Total		53 (50.0%)	53(50.0%)	106 (100.0%)

Chi-Square Test = 1.010 p-value = 0.315

Table No. 6: Frequency Distribution of "Post operative wound infection" With respect to study groups

		Study Group		
		Polydio-xanone	Prolene	Total
Post operative Wound Infection	Present	7 (6.6%)	18 (17%)	25 (23.6%)
	Absent	46 (43.4%)	35 (33%)	81 (76.4%)
Total		53 (50.0%)	53(50.0%)	106 (100.0%)

Chi-Square Test = 6.334

DISCUSSION

The midline laparotomy incision is enormously standardized and easy to perform, yet there has been substantial variation in the method of the repair of this incision. The ideal suture should avoid incisional wound infection, wound pain or the formation of suture sinus.[12,13,14]

Within the last many years the habitual trend of using non-absorbable sutures has been changed, with numerous studies and meta-analyses advocating the use of slowly absorbable sutures, claiming comparable wound strength with significantly lower prevalence of wound complications.[15,16] There is a verity of literature in which the different kind of suture material has been tested, many of them are in favor of different kind of suture materials (like observable and non-observable). Similarly we conducted this study to see the effectiveness of Polydioxanone and Prolene in midline closure. We compared these two suture materials in terms of less postoperative wound infection. According to this study our experience shows that the Polydioxanone has less but statistically insignificant postoperative complications like suture breaking, knot slipping and wound infection.The healing process of abdominal fascia after surgical incision continues for 9 to 12 months.[17,18]

Various studies[19,20] have demonstrated a significantly lower incidence of wound infection in the Polydioxanone group. Similarly in our study, the incidence of wound infection was statistically high in group of Prolene.[21]

According Dooren VP et al[22] concluded after a follow-up period of 60 months the use of Polydioxanone and Prolene for closure of the abdominal fascia after laparotomy showed no significant difference in the occurrence of wound infection which was clearly contradictive from our study.

CONCLUSION

Polydioxanone is a synthetic monofilament absorbable suture, which is relatively inert in tissues and retains its strength for longer than other absorbable materials. According to our experience Polydioxanone causes less wound infection and wound dehiscence as compared to Prolene in midline abdominal wound closure.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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