Original Article

Polydioxanone vs Prolene Closure for Midline Abdominal Incisions: To Compare Postoperative Wound Dehiscence

1. Afzal Siddique 2. Malik Asrar Ahmed 3. Zia-ur-Rehman

1. Senior Registrar of Surgery, 2. Asstt. Prof. of Surgery, 3. Prof. of Surgery and Principal, Poonch Medical College, Rawlakot, Azad Jammu & Kashmir

ABSTRACT

Objectives: The objective of this study was the comparison of Polydioxanone and Prolene for midline abdominal closure in terms of postoperative wound dehiscence.

Study Design: Randomized control trial

Place and Duration of Study: This study was conducted at Department of Surgery, Sheikh Khalifa Bin Zaid Al Nahyan Hospital Rawlakot Azad Kashmir from 20-12-2012 to 25-12-2014.

Materials and Methods: We studied 106 patients for midline closure of abdominal surgery. We made two groups (Group A consisted patients in whom abdominal closure was done with Polydioxanone no. 1 and Group B contained patients who underwent closure with Prolene no. 1. The outcome variablewas wound dehiscence.

Results: The average of age for 106 patients was 36.88 ± 13.28 years. In group A, the wound dehiscence was seen in 4 (3.8%) patients while in group B it was seen in 12 (11.3%) patients. Wound dehiscence was considerably high in group B as compared to groups A, (p-value < 0.05).

Conclusion: Polydioxanone is a synthetic absorbable suture which retains its strength for longer than other absorbable materials. According to our experience Polydioxanone causes less wound dehiscence as compared to Prolene in midline abdominal wound closure.

Key Words: Abdominal closures,suturematerial,midline surgery and wound dehiscenc

Citation of article: Siddique A, Ahmed MA, Rehman Z. Polydioxanone vs Prolene Closure for Midline Abdominal Incisions:To Compare Postoperative Wound Dehiscence. Med Forum 2015;26(6):40-43.

INTRODUCTION

Despite advances in suture materials, abdominal fascial closure reflects a surgeon's personal preference. The value of a particular suture material may be measured by the rateof wound complications. Wound dehiscence is one of the early wound complications[1]. Healing process of abdominal layers after surgical incision continues for 9 to 12 months.[2,3] The mean time for wound dehiscence is 8–10 postoperative days. With recent advances in suture material and the use of mass closure technique the rate of dehiscence has generally been less than 1%,[4] although a recent report from the Veterans Affairs national quality program has documented a rate of 3.2%.[5]

Abdominal wound dehiscence can be associated with patient's or technical factors.[7] The rate of wound dehiscence is still very high in our hospitals. The results of a trial showed wound dehiscence of 6.8%.[7]

The choice of material for closing the abdominal layers should depend upon the properties of that material like strength, durability, ease of handling, and resistance to infection. Nonabsorbable materials (e.g., poly propylene) have been widely used for abdominal fascial closure since many years, but their use is associated with highrate of sinus formation and wound pain.[1]

Absorbable materials are designed to approximate the abdominal layers and subsequently to undergo absorption to avoid these problems associated with nonabsorbable sutures. Polydioxanone (PDS) is one of the most commonly used slowly absorbable materials. Its absorption takes about 180 days, and they maintain 50% of their tensile strength for about four weeks. It has shown to have 1.7 times the tensile strength of Prolene. On review of a meta-analysis, absorbable monofilament suture material was found superior in comparison with nonabsorbable monofilament.[1] The most common nonabsorbable materials used are polypropylene, nylon, polyethylene, and polyamide[8].

Most authors suggest that a slowly absorbable suture material is better than a non-absorbable suture material for closure of the abdominal layers[9]. 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 dehiscence.

Correspondence: Dr. MalikAsrar Ahmed
Assistant Professor of Surgery, Poonch Medical College, Rawlakot, Azad Jammu & Kashmir
Cell No.: 03234004413
E-mail: ajkdrasrar@yahoo.com

MATERIALS AND METHODS

This study was conducted at Department of Surgery Sheikh Khalifa Bin Zaid Hospital Rawlakot Azad

Kashmir. The study was completed in two year timefrom 20-12-2012 to 25-12-2014.

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.
- Patients aged 15 years or above.
- ASA (American Society of Anesthesiologists) grade I and II.

Exclusion Criteria

- Coagulopathy .A deranged PT and APTT of more than 10 sec. and INR of more than 3 was excluded.
- Radiotherapy of the abdomen.
- Pregnant woman (if urinary beta HCG is positive).
- Current immunosuppressive therapy.
- Patients who developed post-operative wound infection.

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.

Approval by the hospital ethical committee was taken.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 of our hospital. The patients wereallocated either to group A or B randomly (randomization) by Lottery method.

Group A:Patients in whom abdominal closure was done with Polydioxanoneno. 1.

Group B: Patients in whom abdominal closure was done with Proleneno. 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 dehiscence 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 if it was present, was only requested if the white blood cell (WBC) count on regular examination was more than 11,000 cm^3.

Data Analysis: All the data was entered on SPSS. Mean and standard deviation was calculated for quantitative data, i.e., age. Frequencies and percentages was calculated for qualitative data, i.e. wound dehiscence.

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

RESULTS

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

In group A the wound dehiscence was seen in 4 (3.8%) patients while in group B it was seen in 12 (11.3%) patients. Wound dehiscence was considerably high in group B as compared to groups A, (p-value < 0.05). (Table # 2).

Table No.1: 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 "Wound Dehiscence" With respect to study groups

		Study Group		
		Polydioxa-none	Prolene	Total
Post operative Wound Dehiscence	Present	4 (3.8%)	12 (11.3%)	16 (15.1%)
	Absent	49 (46.2%)	41 (38.7%)	90 (84.9%)
Total		53 (50%)	53 (50%)	106 (100%)

Chi-Square Test = 4.71 p-value = 0.030

DISCUSSION

The midline laparotomy incision is 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 dehiscence, without increasing wound infection, wound pain or the formation of suture sinus.[10,11,12]

During the last many years the trend of using non-absorbable sutures has been changed. Numerous studies and meta-analyses advocate the use of slowly absorbable sutures, claiming comparable wound strength with significantly lower prevalence of wound complications.[13,14]

Abdominal layers closure has remained a procedure that often reflects a surgeon's personal first choice. Frequent randomized controlled trials of abdominal layers closure have unsuccessful to decide the ideal suture material with favorable conclusions[15,16]. Certain studies[17] recommend the use of non-absorbable sutures, where as others[18,13] advocate slowly absorbable suture material for abdominal layers closure.

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 absorbable and non-absorbable). Similarly we conducted this study to see the effectiveness of Poly-dioxanone and Prolene in midline closure. We compared these two suture materials in terms of less postoperative wound dehiscence. According to this study, our experience shows that the Polydioxanone has less but statistically insignificant postoperative complications like suture intact suture cutting out of the tissue and protrusion of gut or omentum from the wound.

On the comparison of wound dehiscence low rate of wound dehiscence in the Polydioxanone group has been observed in our study, which is also according to the previously published studies.[16,19]

Accordingto Dooren VP et al[20,] after a follow-up period of 60 months the use of Polydioxanone and Prolene for closure of the abdominal layers showed no significant difference in the occurrence of wound infection and dehiscence which was clearly contradictive from our study.

CONCLUSION

Polydioxanone is a synthetic absorbable suture, which retains its strength for longer than other absorbable materials. According to our experience Polydioxanone causes less 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.

REFERENCES

1. Ceydeli A, Rucinski J, Wise L. Finding the Best Abdominal Closure: An Evidence-based Review of the literature. Curr Surg 2005; 62: 220-5.
2. Rath AM, Chevrel JP. The healing of laparotomies: a re-view of the literature. Part 1. Physiologic and pathologic aspects. Hernia. 1998;2:145-9.
3. Douglas DM. The healing of aponeurotic incisions. Br J Surg 1952;40:79-84.
4. Culver DH, Horan TC, Gaynes RP, Marton WJ, Jarvis WR, Emori TG, et al. Surgical wound infection rates by wound class, operative procedure, and patient risk index. National Nosocomial Infections Surveillance System. Am J Med 1991;91:152S-157S.
5. Bucknell TE, Cox PJ, Ellis H. Burst abdomen and incisional hernia: a prospective study of 1129 major laparotomies. BMJ 1982;284:931-3.
6. Eva DMF, Adam SRB, Sharif M, Iain AA. Tensile Strength Of Surgical Knots In Abdominal Wound Closure [Surgical Technique]. ANZ J Surg 2008; 78:164-6.
7. Waqar SH, Malik ZI, Zahid MA, Shafique M. Frequency of wound dehiscence / burst abdomen in midline laparotomies. Ann Pak Inst Med Sci 2005;1:74-8.
8. Paral J, Ferko A, Varga J, Antos F, Plodr M, Lochman P, et al. Coparison of sutured versus non-sutured subcutaneous Fat tissue in Abdominal Surgery. Eur Sur Res 2007; 39:350-8.
9. Fischer L, Baumann P, Hüsing J, Seidlmayer C, Albertsmeier M. A historically controlled, single-arm, multi-centre, prospective trial to evaluate the safety and efficacy of MonoMax® suture material for abdominal wall closure after primary midline laparotomy. BMC Surg 2008;8:12.
10. Weiland DE, Bay RC, Del Sordi S. Choosing the best abdominal closure by meta-analysis. Am J Surg 1998;176(6):666-70.
11. Gaikwad V, Kapoor R, Thambudorai. An ideal suture for midline closure? Ind J surg 2009;71: 128-32.
12. Pavlidis TE, Galatianos IN, Papaziogas BT, Lazaridis CN, Atmatzidis KS, Makris JG, Papaziogas TB, et al. Complete dehiscence of the abdominal wound and incriminating factors. Eur J Surg 2001;167:351-4.
13. Leaper DJ, Pollock AV, Evans M. Abdominal wound closure: a trial of nylon, polyglycolic acid and steel sutures. Br J Surg 1977;64:603-6.
14. Rucinski J, Margolis M, Panagopoulos G, Wise L. Closure of the abdominal midline fascia: meta-analysis delineates the optimal technique. Am Surg. 2001;67:421-6.
15. Gys T, Hubens A. A prospective comparative clinical study between monofilament absorbable and non-absorb-able sutures for abdominal wall closure. Acta Chir Belg 1989;89:265-70.
16. Korenkov M, Sauerland S, Arndt M, Bograd L, Neugebauer EAM, H T. Randomized clinical trial

of suture repair, polypropylene mesh or autodermalhernioplasty for incisional hernia. Br J Surg 2002;89(1):50-6.

17. Weiland DE, Bay RC, Del Sordi S. Choosing the best abdominal closure by meta-analysis. Am J Surg 1998;176(6):666-70.
18. van'tRiet M, Steyerberg EW, Nellensteyn J, Bonjer HJ, Jeekel J. Meta-analysis of techniques for closure of midline abdominal incisions. Br J Surg 2002;89:1350-6.
19. Carlson MA, Condon RE. Polyglyconate (Maxon) versus nylon suture in midline abdominal incision closure: a prospective randomized trial. Am Surg 1995;61(11):980–3.
20. Dooren VP, Bloemen A, Huizinga B, Hoofwijk AGM. Long-term incidence of incisional hernia after abdominal surgery: a prospective randomized trial comparing two suture materials. Department of general surgery at the Orbis Medical Centre, Sittard, the Netherlands. Online available from: http://74.125.155.132/scholar?q=cache:12AgARXL0e0J:scholar.google.com/&hl=en&as_sdt=2000.