Section: General Surgery

Original Research Article

A PROSPECTIVE COMPARATIVE STUDY OF ABSORBABLE POLYDIOXANONE (PDS) LOOP VS NON-ABSORBABLE POLYAMIDE LOOP IN ABDOMINAL WALL CLOSURE IN MIDLINE LAPAROTOMY.

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ABSTRACT

Background: Abdominal fascial closure is a topic of debate since a long time, many studies have been conducted to compare different suture materials but could not reached to the conclusion. This study is intended to answer one of the many questions, of which suture material is best to use for midline fascial closure between delayed absorbable versus non-absorbable.

Materials and Methods: All patients admitted and requiring laparotomy between January 2023 to January 2024 were divided into two equal groups randomly. Group A included patients with polydioxanone laparotomy fascial closure and Group B included patients with polyamide laparotomy fascial closure and post operative complications were observed for one year.

Results: 140 cases of midline laparotomy were taken. An equal number of cases were divided into both groups (70 cases). Patients were followed up and operative wounds were examined on postoperative days 3, 5, 7,11,15, 1 month,3 Months,6 Months, and 1 Year after surgery for post-operative complications which were more in polyamide group.

Conclusion: Though the rates of wound complications between the two sutures were found statistically insignificant, wound complications with non-absorbable suture Polyamide were found to be more compared to delayed absorbable suture polydioxanone.

Keywords: Polyamide, Polydioxanone, Laparotomy, Wound dehiscence, Burst abdomen.

INTRODUCTION

Whether imposed by accident or nurtured during the surgical course, every tear is just a disturbance of the routine continuation of tissue. When tissue has been fragmented so oppressively, that it can not heal inherently (without complexities or possible disfiguration). It must be held in apposition until the recovery process provides the injury with sufficient strength to fight stress without mechanical support.

The confusing states commonly encountered are that which suture material is best for midline laparotomy sheath closure. There are reasons and advocates of both absorbable and non-absorbable suture materials for midline laparotomy sheath closure. Non-absorbable sutures are a popular choice for it, but delayed absorbable sutures like polydioxanone are gaining popularity with their textbook property. Commonly used suture for midline laparotomy sheath closure like Polyamide retains its strength for longer period but it is non-absorbable suture. In compared to it polydiaxanone, is a delayed absorbable suture material which maintains it's tensile strength for a longer period of time but it gets absorbed in a time. So, this study in turn compares the outcome of laparotomy incision closure with polyamide and polydioxanone in cases operated at tertiary care hospital.[1-4]

Aims and Objective

Aim: To compare suture materials in midline laparotomies by studying the complications of wound closure with Polydioxanone loop vs polyamide loop

Objectives: (A) To study the proportion of occurrence of wound infection. (B) To study the proportion of superficial wound dehiscence & deep wound dehiscence (burst abdomen). (C) To study the proportion of suture sinus and stitch granuloma formation. (D) To study the proportion of incisional hernia.

MATERIALS AND METHODS

Study Design and Setting: This Comparative prospective study is conducted among indoor patients in the Department of General Surgery at the tertiary center, Surat from January 2023 to January 2024. The study was approved by the institutional ethics committee, and all patients provided written informed consent for participation. From Jan '23 to Jan '24 total of 140 patients were admitted for midline laparotomy (emergency & Elective), which were taken for study.

Inclusion Criteria

Male and female patients. Patients older than 18 years of age. The study included emergency and elective laparotomy.

Exclusion Criteria

Re-do laparotomy, Laparotomy for malignancy (peritoneal Mets)

Immunocompromised patients (on chemotherapy, radiotherapy, or on steroids), Patients with renal failure or hepatic failure, coagulation disorder. Pregnant patients.

Data Collection and Randomization: The patients who fulfilled the inclusion and exclusion criteria were selected for this study. Detailed histories of the patients were taken, and Patients were examined clinically in proper daylight and exposure. All patients were divided into two equal groups randomly. All laparotomy wounds (emergency and elective) were closed with polydioxanone (PDS) or Polyamide on even and odd numbers. An even number of patients' midline sheath was closed using polydioxanone (PDS) and were assigned group A. An odd number of patients' midline sheath was closed using polyamide and were assigned group B.

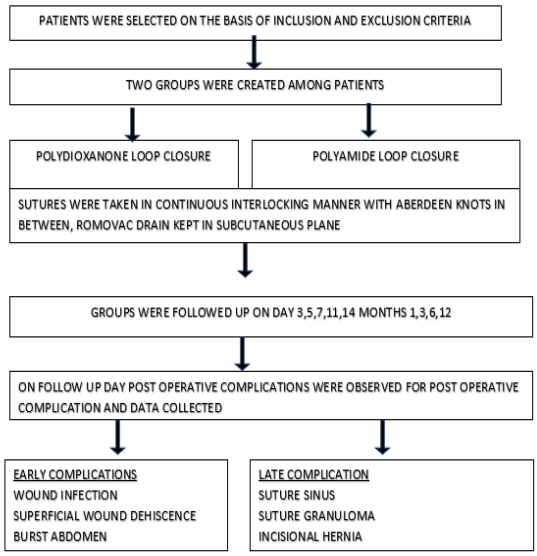
- Dealt with primary intra-abdominal pathology; thorough peritoneal wash was given, and drains were kept at the required place.
- Mass closure at the midline (peritoneum, muscle, sheath) was done with either polydioxanone loop no. 1 (group A) or Polyamide loop no.1 (group B) in a continuous interlocking manner with Aberdeen's knot in between.

Preoperative Preparation (same in both the groups): All the routine investigations like CBC, LFT, RFT, PT, INR, APTT, ECG, X-ray of adjacent parts, and chest x-ray, and associated comorbidities like anemia, jaundice, diabetes, hypertension, respiratory disorders were controlled respectively before Elective surgeries.

Operative Method Same For Both Groups: Under General anesthesia, adequate midline incision was kept using knife no. 22. Subcutaneous tissue and sheath opened (at linea alba) using electro-cautery, and carefully peritoneum was opened without damaging the intra-abdominal structure.

- Subcutaneous tissue closed with vicryl 2-0 in the simple interrupted manner in each patient of both the groups
- Skin was closed with Ethilon 2-0 in the same manner in all patients.

Statistical Analysis: Data was collected and analyzed statistically. A p-value <0.05 was considered statistically significant.



RESULTS

In this study population, the majority of patients were male in the age group 31-45 years, of which group A (38.1%) and group B (41.4%). Patients included in this study population had BMIs of 18.5 to 24.9, of which group A (57.1%) and group B (55.7%). 15.7% of group A and 18.6% of group B were of high BMI up to ≥ 30. Associated comorbidities were matched in both groups, and the Majority of the patients had hypertension and Diabetes among both groups. In this study population, patients with clean and clean-contaminated wounds were included and were equally matched. Among clean contaminated wounds, group A contains 55.7% and group B contains 62.9% patients.

Postoperative Pain was observed among 27.1% of patients in group B and 7.1% patients in group A. A higher number of patients in polyamide group complained about discomfort kind of pain in late postoperative period.

Wound Infections were observed more among group B (24.3%) compared to group A (18.6%). The difference was not statistically significant. Superficial Wound Dehiscence was observed more among group B (18.5%) compared to group A (11.4%). 2.85% patients in group B (polyamide group) showed burst abdomen. None of the cases in Group A developed Burst abdomen. Both the groups were compared for the Incisional hernia, but none of the group observed incisional hernia in a follow-up period of one year. Stitch Granuloma and Suture Sinus was observed in one patient in group B and not observed in group A. The difference was statistically not significant. Hospital Stay was <15 days among the majority of the patients in both group A (57.1%) and group B (70%) and comparable between the groups.

Table 1: Clinical data of Patient

No	Variable	Group A (N = 70)	Group B (N =70)	P value
A	AGE (YEARS)			
	18 to 30	17	16	0.912
	31 to 45	27	29	
	46 to 60	22	19	
	61 to 75	2	4	
	>75	2	2	
B	GENDER			
	Male	60	58	0.642
	Female	10	12	
C	BMI			
	18.5 to 24.9	40	39	0.902
	25 to 29.9	19	18	
	>30	11	13	
D	COMORBIDITY			
	Hypertension	12	10	0.881
	Diabetes	10	8	
	COPD	2	1	
	IHD	3	2	
	Jaundice	0	0	
	No comorbidity	31	26	
E	WOUND TYPE			
	Clean	31	26	0.491
	Clean contaminated	39	44	

DISCUSSION

Midline laparotomy offers the advantage of exposure and ease of access to several organs but still poses a risk of impaired wound healing due to the avascular nature of linea alba.[4] Abdominal wall closure aims to restore the function of the abdomen after surgery without complications, like wound infections, dehiscence, sinuses, stitch granuloma and incisional hernia.[5] Wound healing process after abdominal closure is dynamic process with changing wound condition and changing health status of the patient.[6] A careful selection of suture material is an important factor among several factors that affect the wound closure. Sutures are a foreign material implanted into human tissues lead to a foreign-body tissue reaction. Selection of suture material for closure of abdominal wall is still problem despite of the advances in

surgical technique.[7] It has been said that nearly half of all post-operative complications are related to wounds. It increases the morbidity and hospitalization of the patient as well as total cost of treatment and at times leads to an increase in mortality.[8]

- In present study, the two groups were well matched according to age, gender, type of surgery, degree of contamination, incision and patient- related factors.
- Majority of the patients were 31 to 45 years age group among both group A (38.6%) and group B (41.4%).
- Majority of the patients were male among both group A (85.7%) and group B (82.9%).
- Majority of the patients had 18.5 to 24.9 BMI among both group A (57.1%) and group B (55.7%).
- Clean contaminated type of wound was more common in both group A (55.7%) and group B (62.9%).

Table 2: Early Post operative complications

No	Parameters (Early Post Op Complications)	Group A	Group B	P Value
1	Post-operative pain (VAS)			
	>5	5	19	0.0029
	<5	65	51	
2	Wound Infection			
	Yes	13	17	0.41
	No	57	53	
3	Superficial wound dehiscence			
	Yes	8	11	0.459
	No	62	59	
4	Burst abdomen			
	YES	0	1	0.316
	No	70	69	

Table 3: Late post operative complications

No	Parameters (Late Post Op Complications)	Group A	Group B	P Value
1	Suture sinus			
	Yes	0	1	0.316
	No	70	69	
2	Stitch Granuloma			
	Yes	0	1	0.316
	No	70	69	
3	Incisional hernia			
	Yes	0	0	1.00
	No	70	70	
4	Hospital stay (days)			
	<10	17	22	0.772
	11 to 15	41	39	
	16 to 20	8	6	
	>20	4	3	

The study found that post-operative pain was significantly higher in the polyamide group (27. 1%) compared to the polydioxanone group (7. 1%). Other studies noted similar trends, with nylon sutures causing more wound pain than PDS,[9] Wound infection rates were also higher in the polyamide group (24. 3%) than in the polydioxanone group (18. 6%), although this difference was not statistically significant. The overall infection rate was 21. 4%, and while nylon showed a higher surgical infection rate compared to PDS, the difference was not major.[10]

Incidences of superficial wound dehiscence were higher in the polyamide group (18. 5%) than in the polydioxanone group (11. 4%), but this was not statistically significant.[11] Burst abdomen occurred more frequently in the polyamide group, but data showed that absorbable sutures like PDS provide longer support for wound healing.[12] Suture sinus and stitch granuloma occurred in 1. 4% of patients in the polyamide group, while there were no cases in the polydioxanone group. Absorbable sutures appeared to reduce complications associated with non-absorbable sutures.[13] Both groups had comparable incidences of incisional hernia. There were no significant differences in hospital stays between the two groups, which ranged from 11 to 15 days for most patients. Various studies reported similar findings, indicating no significant differences in wound complications or hernia rates between absorbable and non-absorbable sutures.[14-21]

In conclusion, the use of polydioxanone sutures for abdominal closures may lead to less post-operative pain and fewer complications compared to nylon sutures. Overall, both types of sutures performed comparably in terms of wound healing and complication rates.

Strength and Limitations

The institutional residential program has a limited time for research work; and a longer follow-up for more than a year was not possible. So to conclude about late complications like stitch granuloma, stitch sinuses and development of incisional hernia, study

of longer duration and large study population is suggested.

CONCLUSION

Based on the observations made in this study, it has been concluded that : Polydioxanone has upper edge over Polyamide in terms of wound infections, scar pain, superficial wound dehiscence. Polydioxanone has no incidence of stitch granuloma and suture sinus formation in present study but polyamide has one occurrence of each ycomplication. Polyamide has two cases of burst abdomen which required re-operation for tension suturing whereas polydioxanone has none.

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