



Prophylactic Retention Sutures in Midline Laparotomy in High Risk Cases to Prevent Wound Dehiscence

KEYWORDS

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ABSTRACT

Introduction: Abdominal Wound Dehiscence is a common post-operative complication with high morbidity and mortality. Several risk factors for the occurrence of dehiscence have been described. Retention sutures are often used in surgical take-back for dehiscence.

Methods: 50 patients who underwent midline laparotomy for various causes with 2 or more of the risk factors for dehiscence were randomised into two groups of 25 each. The study group in which laparotomy wound was closed with conventional mass closure along with full thickness retention sutures and a control group in which mass closure alone was done.

Result: The incidence of wound dehiscence in the study group was reduced. There was only 1 case of dehiscence in the study group compared to 5 in the control group. All 5 cases of WD in the control group underwent re-laparotomy and fascial closure. There was no significant difference in the post-operative pain and duration of hospital stay in both the groups.

Conclusion: The study concludes that, prophylactic retention sutures could reduce the incidence of wound dehiscence in midline laparotomy in cases with multiple risk factors without imposing remarkable post-operative complications.

INTRODUCTION

Wound dehiscence is described as partial or complete disruption of an abdominal wound with or without protrusion or evisceration of abdominal contents.(1)

Wound dehiscence could be, partial or complete depending on the extent of separation. In partial dehiscence, deep fascia is involved with skin remaining intact. In complete wound dehiscence, all layers of the wound thickness are separated, with or without associated protrusion of a viscous. (2)

It is among the most dreaded complications faced by surgeons and of greatest concern because of risk of evisceration, the need for immediate intervention, and the possibility of repeat dehiscence, surgical wound infection and incisional hernia formation.(3)

Morbidity in the form of prolonged hospital stay, increased economic burden on health care resources and long term complication of incisional hernia can be reduced by highlighting the risk factors for wound dehiscence, the incidence rate and remedial measures to prevent or reduce the incidence of wound dehiscence.(6)

In all cases, the wound has to be examined for the presence of any hematoma or weakening of the fascia or presence of boggy swelling which indicates that a knuckle of bowel has herniated through the abdominal wall.

AIMS AND OBJECTIVES OF THE STUDY

To study the effects of retention sutures in high risk patients who undergo midline laparotomy in terms of the following:

- The incidence of wound dehiscence
- The intensity of post-operative pain
- The need to re-operate due to dehiscence
- The duration of hospital stay

METHODOLOGY

- Patients who presented to JSS, Hospital who underwent midline laparotomy between September 2013 to August 2015 were included in the study
- A total of 50 patients were studied who were randomized into two groups of 25 each. A study group in which abdomen closure was done by conventional mass closure using either PDS or Prolene along with retention sutures. A control group in which conventional mass closure was done without retention sutures.
- Randomization was done on the basis of admission into units. Patients admitted into 1,4 and 6 were taken into the study group. Patients admitted into 2,3 and 4 were taken into the control group
- Patient selection was based on the presence of risk factors for wound dehiscence. All patients having two or more of the following criteria for dehiscence were included in the study.

INCLUSION CRITERIA

Adult Patients who underwent midline laparotomy with two or more of the following risk factors

1. Age more than 60years
2. Emergency laparotomy
3. Diabetes mellitus
4. Poor nutritional status (clinical cachexia or hypoalbuminemia)
5. Intra-abdominal infection
6. Malignancy
7. Chronic use of corticosteroids (T. Prednisolone >10mg for >= 3 months)
8. Chronic kidney disease
9. Anemia (Hb<10gm%)
10. Chronic pulmonary diseases (COPD, bronchitis, Tuberculosis)
11. Clinical jaundice (total bilirubin >3mg/dl)

EXCLUSION CRITERIA:

1. Patients younger than 18 years of age
2. Patients who underwent midline laparotomy without any of the above mentioned risk factors.

- The technique of retention sutures employed was interrupted sutures to transfix all layers of abdominal wall including skin, subcutaneous tissue, fascia and peritoneum. The suture material used was Nylon-1(sutopac). Sutures were taken approximately 5cm from the margin of wound and approximately 5cm apart. Subcutaneous drains either open rubber drains or closed suction drains were placed to prevent seroma formation. At the skin level, sutures were threaded with rubber tubes to prevent skin damage.

Post-operatively, patients were assessed for the occurrence of wound dehiscence.

- Precise examination of wound was done from post-operative day 3 upto day 14 for the presence of pink sero-sanguinous discharge or any subcutaneous collection
- In the presence of seroma or wound infection, few sutures were opened to let out the collection, examination of the integrity of fascia by digital examination of wound depth. Regular wound toileting was done in the presence of infection. Antibiotic coverage based on pus culture & sensitivity report and later wound closure by secondary suturing was done after infection control.

PAIN ASSESSMENT

Post- operative pain was assessed using Numerical Rating Scale (NRS)

RESULTS

TABLE 1: DISTRIBUTION OF CAUSES FOR LAPAROTOMY IN STUDY & CONTROL GROUPS

			GROUPS		TOTAL
			CONTROL	STUDY	
DIAGNOSIS	PERFORATION	Nos	14	7	21
		%	56.0%	28.0%	42.0%
	MALIGNANCY	Nos	8	7	15
		%	32.0%	28.0%	30.0%
	TRAUMA	n	0	5	5
		%	0.0%	20.0%	10.0%
	INTESTINAL OBSTRUCTION BENIGN	n	2	5	7
		%	8.0%	20.0%	14.0%
	ISCHAEMIA & GANGRENE	n	1	1	2
		%	4.0%	6.7%	4.0%
TOTAL			25	25	50
			100.0%	100.0%	

Perforation is one of the main causes of laparotomy in our study which is around 42% and second cause is being malignancy which is around 30%.

TABLE 2: TYPE OF SURGERY

TYPE OF SURGERY		STUDY GROUP	CONTROL GROUP	TOTAL
PERFORATION CLOSURE & OMENTOPLASTY	NUMBER (%)	8 (32.0%)	13 (52.0%)	21 (42.0%)
RESECTION & ANASTOMOSIS (BENIGN)	NUMBER (%)	7 (28.0%)	3 (12.0%)	10 (20.0%)
ADHESIOLYSIS	NUMBER (%)	2 (8.0%)	0.0 (0)	2 (4.0%)
SPLENECTOMY	NUMBER (%)	1 (4.0%)	0.0 (0)	1 (2.0%)
RESECTION & ANASTOMOSIS (MALIGNANT)	NUMBER (%)	7 (28.0%)	9 (36.0%)	16 (32.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

- The assessment of pain in clinical & research setting is in terms of intensity or magnitude of the pain.
- NRS or VAS is the most commonly used pain assessment scales.
- For 0-10 NRS scale, the rating chosen has a specific meaning in terms of the impact of pain on functioning.
- Rating of 1-4 was taken as mild pain. 5-6 as moderate pain and 7-10 as severe pain.
- Patients were assessed daily up to 10 days post-operative period and asked to rate the intensity of pain in terms of numbers from 1-10 and responses were recorded.
- VAS shows higher failure rates compared to NRS.
- In terms of preferences, patients prefer NRS over VAS.
- Retention sutures were removed 2 weeks post-operatively and patients were followed up for a period of 1 month for monitoring the features of dehiscence and incisional hernia formation.
- The duration of hospital stay was recorded for all the cases.

STATISTICAL ANALYSIS

Statistical methods applied were-

- 1) Descriptive statistics
 - 2) Repeated measures. ANOVA
 - 3) Cross tabulations (contingency table)
 - 4) Independent samples 't' test
- All the statistical methods were carried out through the SPSS for Windows (version 16.0)
 - P <0.050 was considered statistically significant

In our study, various surgeries were performed. Since, emergency laparotomy was more in our study. perforation closure with omentoplasty was the most common in both the groups followed by resection and anastomosis for benign as well as malignant causes. There is no significant difference in distribution of type of surgery in both groups.

TABLE 3: PREVALANCE OF HYPERBILIRUBINEMIA

		STUDY GROUP	CONTROL GROUP	TOTAL
ELEVATED BILIRUBIN	YES	NUMBER (%) 4 (16.0%)	0 (0%)	4 (8.0%)
	NO	NUMBER (%) 21 (84.0%)	25 (100.0%)	46 (92.0%)
Total (%)		NUMBER 25 (100.0%)	25 (100.0%)	50

The total number of cases of hyperbilirubinemia encountered in the study was less (4 in number). This was probably because of early presentation in sepsis and also because hepatobiliary pathology was avoided in the study in which post-operative ascites is encountered.

TABLE 4: PREVALANCE OF HYPOPROTEINEMIA

HYPO-PROTEINEMIA		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	3 (12.0%)	3 (12.0%)	6 (12.0%)
NO	NUMBER (%)	22(88.0%)	22 (88.0%)	44 (88.0%)

Hypoproteinemia is one major risk factor for delayed post-operative recovery and wound healing. In our study there were only 6 patients with hypoproteinemia out of 50, 3 in each study and control group. This was mainly because of acute presentation of the cases and

TABLE 5: EMERGENCY SURGERY

EMERGENCY LAPAROTOMY		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	20 (80.0%)	17 (68.0%)	37 (74.0%)
NO	NUMBER (%)	5 (20.0%)	8 (32.0%)	13 (26.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

Emergency laparotomy is one of the major risk factor for occurrence of wound dehiscence and incisional hernia. Technique of closure, presence of intra-abdominal sepsis and the general condition of the patient all have influence on healing. In the study, 37 out of 50 cases were emergency laparotomy.

TABLE 6: PREVALANCE OF INTRA-ABDOMINAL MALIGNANCY

MALIGNANCY		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	7 (28.0%)	10 (40.0%)	17(34.0%)
NO	NUMBER (%)	18 (72.0%)	15 (60.0%)	33 (66.0%)
TOTAL	NUMBER (%)	25(100.0%)	25(100.0%)	50 (100.0%)

Malignancy delays wound healing due to the combined effects of anemia, hypoproteinemia and lack of inflammatory mediators which are essential for wound healing. In the study, we encountered a total of 17 cases of intra-abdominal malignancy, in which few were pre-operatively di-

agnosed and few were intra-operative finding in an emergency setup.

TABLE 7 : EFFECTS OF RISK FACTORS ON PATIENTS WITH WOUND DEHISCENCE

RISK FACTORS	PRESENT	ABSENT	TOTAL
AGE > 60	4	2	6
DIABETES MELLITUS	3	3	6
ANEMIA	2	4	6
EMERGENCY LAPAROTOMY	3	3	6
LEUCOCYTOSIS	3	3	6
HYPOALBUMINEMIA	3	3	6
MALIGNANCY	0	6	6
CORTICOSTEROID INTAKE	1	5	6
CKD	4	2	6
COPD	2	4	6
HYPERBILIRUBINEMIA	1	5	6

Out of the risk factors, the most prevalent were age>60 yrs and anemia in 4 out of 6 patients followed by emergency laparotomy, leukocytosis, diabetes mellitus and malignancy in 3 out of 6 patients.

POST-OPERATIVE COMPLICATIONS:

TABLE 8: SEROMA FORMATION

SEROMA FORMATION		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	0 (0.0%)	7 (28.0%)	7 (14.0%)
NO	NUMBER (%)	25(100.0%)	18 (72.0%)	43(86.0%)
TOTAL	NUMBER (%)	25(100.0%)	25 (100.0%)	50 (100.0%)

In the post-operative period, no patient in the study group had seroma formation and 7 patients in the control group had seroma formation on post-op day 4 and 5. P<0.05

TABLE 9: INCIDENCE OF WOUND INFECTION

WOUND INFECTION		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	5 (20.0%)	9 (36.0%)	14 (28.0%)
NO	NUMBER (%)	20 (80.0%)	16 (64.0%)	36 (72.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

Wound infection is a very common complication of laparotomy wounds, especially in cases of peritonitis and intra-abdominal sepsis. Wound infection can cause wound dehiscence and incisional hernias later. Intra-operative factors and patient's general condition contribute to the development of wound infection. In our study, there were totally 14 cases of infection out of 50. All were subsequently treated by thorough wound toileting, antibiotics and secondary closure.

TABLE 10: INCIDENCE OF WOUND DEHISCENCE

WOUND DEHISCENCE		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	1 (4.0%)	5 (20.0%)	6 (12.0%)
NO	NUMBER (%)	24 (96.0%)	20 (80.0%)	44 (88.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

The main objective of the study was to determine the incidence of wound dehiscence in the study and control groups. There were totally 6 cases of fascial dehiscence, 5 in the control group and 1 in the study group. The statistical significance was P= 0.082.

TABLE 11: RE-SURGERY

RE SURGERY		STUDY GROUP	CONTROL GROUP	TOTAL
RE-LAPAROTOMY & FASCIAL CLOSURE	NUMBER (%)	0 (0.0%)	5 (20.0%)	5 (10.0%)
SECONDARY SUTURING	NUMBER (%)	5 (20.0%)	8 (32.0%)	13 (26.0%)
NONE	NUMBER (%)	20 (80.0%)	12 (48.0%)	32 (64.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

Undergoing re-surgery is both a physical and financial strain on the patients. In our study, since there were 5 cases of dehiscence in the control group and 8 cases of wound infection, these patients underwent re-laparotomy with fascial closure and secondary suturing respectively. Whereas, since there was only 1 case of dehiscence in the study group who succumbed due to cause unrelated to dehiscence, there was no re-laparotomy in the study group, but only secondary suturing of the 5 cases of wound infection.

TABLE 12: INCIDENCE OF SKIN ULCERATION IN THE STUDY GROUP

SKIN ULCERATION		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	4 (16.0%)	0 (0.0%)	4 (8.0%)
NO	NUMBER (%)	21 (84.0%)	25 (100.0%)	46 (92.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

Skin ulceration and damage is one of the complication anticipated of retention sutures due to the pressure effects. In our study, there were 4 cases of superficial skin ulceration out of 25 which were treated by local applications and dressings.

TABLE 13: MORTALITY

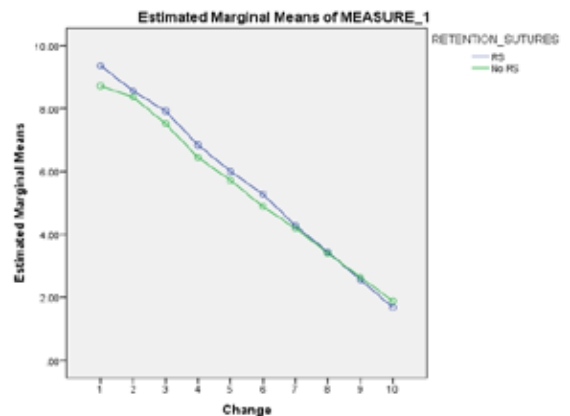
MORTALITY		STUDY GROUP	CONTROL GROUP	TOTAL
YES	NUMBER (%)	1 (4.0%)	1 (4.0%)	2 (4.0%)
NO	NUMBER (%)	24 (96.0%)	24 (96.0%)	48 (96.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

There were 2 mortalities in the study, one in each group.

In the study group, patient presented with perforation & fecal peritonitis, post-surgery he developed ARDS. He had wound dehiscence on 4th post-op day & succumbed on day 10 with complications of septicemia & respiratory failure.

In the control group, a case of perforation with AKI, succumbed on post-op day 3.

GRAPH: POST-OPERATIVE PAIN



Post-operative pain was measured using Numerical Rating Scale (NRS) upto day-10.

There was no significant difference in the average pain score in the groups.

Maximum mean pain score was 8.4 for both the groups.

Both groups showed similar rate of decline over 10 days.

TABLE 14: DURATION OF HOSPITAL STAY

Group Statistics					
	GROUPS	N	Mean	Std. Deviation	Std. Error Mean
HOSPITAL-STAY	CONTROL	14	16.8571	5.69557	1.52221
	STUDY	14	17.0000	2.41788	.64621

The mean duration of hospital stay for both the groups was similar. The mean for study group was 17.0 and the estimated mean duration for control group was 16.8. Hence, application of retention sutures does not prolong the duration of hospital stay.

TABLE 15: INCIDENCE OF INCISIONAL HERNIA

INCISIONAL HERNIA		STUDY GROUP	CONTROL GROUP	TOTAL
NO	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)
TOTAL	NUMBER (%)	25 (100.0%)	25 (100.0%)	50 (100.0%)

There were no cases of incisional hernia encountered in the study. This can be attributed to the short duration of follow-up of the study of only 30 days, which is one of the drawbacks, where the exact incidence of incisional hernia formation cannot be commented upon.

DISCUSSION

Wound dehiscence is a devastating incident that can cause pain, mental distress, infectious complications, and financial burden for the patient, as well as complications including evisceration and re-operation. Surgeon expertise, type of incision, suture material, surgical site infection, nutritional status, persistent cough, abdominal distension, leakage of pancreatic enzymes, anemia, obesity, diabetes, jaundice, old age, emergent surgery, particular procedures like colonic surgery and malignancy have all been suggested to predispose patients to abdominal wound dehiscence. Some of these factors are unavoidable. To lower the incidence of abdominal WD, it has been recommended to stress on the importance of pre-operative care including patient nutritional status, use of prophylactic antibiotics to prevent possible infection, diabetic control, avoid tissue hypoxia, prevention of hypothermia, maintain hemodynam-

ic stability and reduce tissue tension.

Different surgical techniques for closing the wound should be carefully considered. Suture materials are of great importance in providing sufficient strength and influencing adverse events. Some authors have proposed the application of retention sutures as a preventive method to reduce the occurrence of WD and retention sutures have been used as a treatment choice for managing fascial dehiscence. However, due to subsequent pain, post-operative discomfort, and skin maceration, routine application of this technique has not been well accepted. Considering the controversies involved in using this method for the prevention of abdominal WD, our study included only patients at a high risk for developing WD who would benefit the most from prophylactic retention sutures. When risk factors of WD are in opposition to the complications, surgeons should determine which condition is more serious. Complications such as intestinal damage, skin maceration, surgical site infection, post-operative pain & discomfort prohibit the surgeons from performing this technique. But, in the presence of high risk factors, benefits of retention sutures outweigh the disadvantages and the technique should be considered.

Penninckx et al in a study with large sample size, reported a lower rate of incidence for WD when extra preventive measures were taken at the time of wound closure. They suggested that the selection of patients from the high risk population is essential for raising the benefits against the costs and complications of preventive approaches. In contrast, Hubbard and Rever concluded there were no advantages in applying wire retention sutures for the prevention of wound dehiscence. In a recent study conducted by Zhamak et al with 300 patients concluded that retention sutures in a selected pool of high risk patients are beneficial in preventing wound dehiscence and do not cause any significant post-operative complications. As these different studies reveal, performing preventive retention sutures for abdomen closures is useful only in high risk cases and would be of no benefit in an unselected population in reducing the incidence of WD.

Our results showed a significantly lower incidence of WD in the intervention group.(4.0%) compared to the control group (20.0%). The cases in the control group who had dehiscence underwent relaparotomy and closure. All cases included in the study had two or more risk factors for dehiscence and the findings suggest that this method, as a preventive strategy, benefits such a population. The decreased incidence of WD in our study is in line with some other studies. Goligher et al, by applying three methods for closing abdominal laparotomies, suggested that reinforcing the routine methods of closure with retention sutures or application of a wire suture would result in fewer cases of dehiscence. However, the overall incidence of dehiscence was higher in our study (12.0%) due to enrolling high risk patients.

Other post-operative complications like intensity of post-operative pain showed no statistical difference in both the groups. In contrast to the study conducted by Rink et al which reported that pain resulting from retention sutures is much more intense 6-9 days after surgery, often leading to premature removal of the sutures. The rate of seroma formation in the control group was 7(28.0%) on post-operative day 4 & 5 compared to 1(4.0%) in the study group. The wound infection rate in the intervention group was found to be 20.0% compared to 36.0% in the control

group. However, wound infection is a factor that itself predisposes to dehiscence. Therefore, interpreting any differences would be difficult because of this reciprocal effect. 4 (16.0%) patients in the intervention group had skin ulceration due to retention sutures which was treated by local applications and dressings. The mean duration of hospital stay did not show much difference. It was 17 for the intervention group compared to 16.2 in the control group. There was no incisional hernia in any of the subjects. Besides, this study is not able to comment about late hernia formation as the follow-up period considered is 30 days.

As our findings suggest, patient selection among the high risk population with multiple risk factors for wound dehiscence is a prudent approach to apply retention sutures as a prophylactic routine for prevention of WD. With such a treatment approach, the risks of developing dehiscence would outweigh the complications.

Limitations of the study were smaller sample size to interpret the exact incidence of wound dehiscence and the effects of retention sutures. The surgeries were performed by different surgeons hence, there was lack of consistency in the surgical technique applied. The duration of follow-up period was only 30 days. Hence, the incidence of incisional hernia formation could not be studied.

CONCLUSION

The study concludes that, prophylactic retention sutures could reduce the incidence of wound dehiscence in mid-line laparotomy in cases with multiple risk factors without imposing remarkable post-operative complications.



Fig 1: POST-OPERATIVE DAY 3 WITH SUBCUTANEOUS DRAIN



Fig 2 : POST OPERATIVE DAY 15 AFTER REMOVAL OF SUTURES OF MAIN WOUND.



Fig3: FOLLOW-UP AFTER 30 DAYS POST-OP: COMPLETELY HEALED SCAR

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