Original Article

Effects of Prophylactic Retention Sutures on Closure of Laparotomy Wound in High-risk Patients in a Tertiary Care Hospital

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Wound dehiscence is the postoperative separation of musculo-aponeurotic layers. It occurs in up to 4.5-8% laparotomies, usually on 7th-10th postoperative day. It carries a mortality rate of up to 15-20%. Retention Sutures are interrupted sutures placed across wound before formal fascial closure through rubber / latex bolsters and knotted in mattress fashion. The objective of this research was to study the effects of using Prophylactic Retention Sutures on wound complications, specifically on wound dehiscence and surgical site infections. The relevance of the study was to determine whether retention suture can be used prophylactically to prevent wound dehiscence, thus avoiding several complications, reducing health-care cost, providing better quality of life with a shorter hospital stay. The study was an observational, descriptive study with cross-sectional design. We performed the data collection from 1st March, 2021 till 28th February, 2022. The sample size was 65, which included all patients undergoing emergency laparotomy in NRS Hospital having any of the 17 high-risk factors. The data was checked for consistency and completeness and analyzed using SPSS version 20. Proportions were analyzed using Chi-square test. Four patients (6.2%) had wound dehiscence despite retention sutures and 29 (44.6%) had surgical site infection. Association of obesity with wound dehiscence and chronic cough, diabetes, jaundice and malignancy with surgical site infection were statistically significant. The outcome of Prophylactic Retention Suture on wound dehiscence (6.2%) is not statistically significant as opposed to the rate of wound dehiscence without it (4.5-8%). Hence, the use of Retention Sutures is left to the discretion of the operating surgeon.

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Key words **: Wound Dehiscence, Retention Suture, Prophylactic, Burst Abdomen, Surgical Site Infection.**

Laparotomy wound repair has several sequelae like seroma / hematoma formation, Surgical Site Infection (SSI), Evisceration, Wound Dehiscence (WD) (WD), and incisional hernia. Wound Dehiscence is the most serious one among all these in the acute setting. Dehiscence of abdominal wounds most commonly occurs between 7 to 10 days postoperatively but can occur up to 3 months after surgery[1].

Wound dehiscence refers to postoperative separation of the abdominal musculo-aponeurotic layers[1]. Abdominal fascial dehiscence occurs in up to 3.5-4% of patients following a laparotomy, which are associated with significant morbidity and mortality[1]. The mortality rate following a Wound Dehiscence can be as high as 15-20%[2].

Retention sutures are interrupted sutures placed across the wound prior to formal fascial closure, using non-absorbable monofilament sutures, through skin and fascia approximately 2 cm from the wound margins at intervals of 2-3 centimeters.The sutures are threaded through rubber / latex tubing bolsters or commercially available plastic bolsters and knotted at the skin level[2]. The rubber or latex tubings are placed in order to prevent the sutures in high tension to cut through the skin and subcutaneous tissue.

Editor's Comment :

- Retention suture application is widely prevalent currently in the form of treatment for wound dehiscence, and even though it has proven benefit of preventing wound dehiscence primarily, the adverse effects of the procedure limits its usage prophylactically, and is to be kept at the discretion of the surgeon.

WD increases the healthcare cost for the patient by increasing hospital stay as well as by increasing the demand for equipment and accessories needed to repair it.Use of biological or synthetic meshes to repair these wounds is a very well-known and good technique. But the downsides remain that biological meshes are very costly and have low availability in our setup, whereas, use of synthetic meshes is not feasible in infected wounds, which is one of the primary factors for wound dehiscence (Figs 1&2).

Materials and Methods

The objective of the study was to determine the effects of using Retention Sutures prophylactically on wound complications in high-risk patients, specifically

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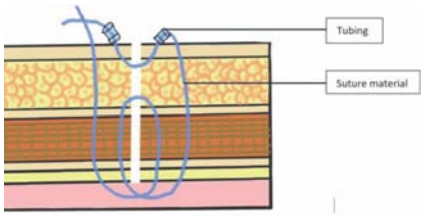

Fig 1 — Application of Retention Sutures using bolsters


Fig 2 — Postoperative image of repair of burst abdomen by application of retention sutures using bolsters

on wound dehiscence and SSI. This was an institution based observational descriptive study with cross-sectional design. The study was conducted from 1st March, 2021 to 28th February, 2022 in Nil Ratan Sircar Medical College and Hospital (NRSMC&H), Kolkata. The sample size was 65, which included all the patients undergoing emergency laparotomy through midline incision, who have been applied Retention Sutures based on the presence of any of the 12 high-risk factors —

(1) Chronic cough – intermittent cough of >8 weeks duration, without phlegm[3]

(2) Hemodynamic instability – Systolic blood pressure < 100 mm of Hg[4,7], Pulse rate > 100 / min[1,4]

(3) Malnutrition – Serum Albumin < 3.0 g/dl[2]

(4) Diabetes mellitus.

(5) Obesity– BMI > 30 kg/m2[5]

(6) Ascites (Imaging or intra-operative finding)

(7) Jaundice– Total serum bilirubin > 2 mg/dL[6]

(8) Immunocompromised / immunosuppression (Use of corticosteroids[5], chemotherapeutic agents[7], diabetes mellitus, AIDS[4,8]).

(9) Intra-abdominal abscess or sepsis[1,2,5,7,9].

(10) Smoking and tobacco use – a person who has smoked 100 cigarettes in his lifetime[10]

(11) Connective tissue disorders – Ehler -Danlos syndrome, Marfan syndrome[1,2,9], ICD-9-CM codes for rheumatoid arthritis 714.0, systemic lupus erythematosus 710.0, scleroderma 710.1, mixed connective tissue disease 710.9, Sjogrens syndrome 710.3 and myositis 710.3[5]

(12) Disseminated malignancy

Approval of the Institutional Ethics Committee was obtained and consents were taken in English, translated to the patient's vernacular. Patients were followed up till their hospital stay or till removal of sutures for incidence of WD, and up to 30 days for SSI. The collected data were checked for consistency and completeness and analyzed using SPSS version 20. Descriptive analysis was done in the form of proportion for categorical variables and mean or median for continuous variables. The difference between proportions was analyzed using Chi square test; p value of less than 0.05 was considered statistically significant.

Observations and Results

In our study, we found that 4 of our patients out of 65 (06.2%), developed WD. In 29 patients (44.6%) had developed SSI after application of prophylactic retention suture. Most of the patients in our sample had multiple comorbidities, the distribution of which is summarized in Tables 1 & 2.

Table 1 — *Distribution and association of WD according to presence of risk factors. *(a) = number of patients with the risk factor, % out of n (n=65). **(b) = % of (a)*

Presence of risk factors [a, (%)*]	Wound Dehiscence [b, (%)**]		χ^2 value, df, p value
	Absent	Present	
Chronic cough [14, 21.5%]	14 (100)	-	1.170, 1, 0.279
Hemodynamic instability [23, 35.4%]	20 (87)	03 (13)	2.926, 1, 0.087
Malnutrition [18, 27.7%]	17 (94.4)	01 (5.6)	0.015, 1, 0.901
Diabetes mellitus [24, 36.9%]	22 (91.7)	02 (8.3)	0.313, 1, 0.576
Obesity [24, 36.9%]	20 (83.3)	04 (16.7)	7.281, 1, 0.007
Ascites [11, 16.9%]	10 (90.9)	01 (9.1)	0.198, 1, 0.657
Jaundice [09, 13.8%]	08 (88.9)	01 (11.1)	0.445, 1, 0.505
Immunocompromised [04, 06.2%]	04 (100)	-	0.279, 1, 0.597
Intra-abdominal abscess or sepsis [12, 18.5%]	11 (91.7)	01 (8.3)	0.121, 1, 0.728
Smoking [22, 33.8%]	20 (90.9)	02 (9.1)	0.497, 1, 0.481
Connective tissue disorders [02, 03.1%]	02 (100)	-	0.135, 1, 0.713
Disseminated malignant disease [19, 29.2%]	17 (89.5)	02 (10.5)	0.889, 1, 0.346

Table 2 — *Distribution and association of SSI according to presence of risk factors. *(a) = number of patients with the risk factor, % out of n (n=65). **(b) = % of (a)*

Presence of risk factors [a, (%)*]	SSI [b, (%)**]		χ^2 value, df, p value
	Absent	Present	
Chronic cough [14, 21.5%]	11 (78.6)	03 (21.4)	3.882, 1, 0.049
Hemodynamic instability [23, 35.4%]	16 (69.6)	07 (30.4)	2.897, 1, 0.089
Malnutrition [18, 27.7%]	11 (61.1)	07 (38.9)	0.330, 1, 0.565
Diabetes mellitus [24, 36.9%]	-	24 (100)	47.233, 1, <0.001
Obesity [24, 36.9%]	13 (54.2)	11 (43.9)	0.023, 1, 0.880
Ascites [11, 16.9%]	07 (63.6)	04 (36.4)	0.365, 1, 0.546
Jaundice [09, 13.8%]	08 (88.9)	01 (11.1)	4.746, 1, 0.029
Immunocompromised [04, 06.2%]	02 (50)	02 (50)	0.050, 1, 0.823
Intra-abdominal abscess or sepsis [12, 18.5%]	04 (33.3)	08 (66.7)	2.896, 1, 0.089
Smoking [22, 33.8%]	12 (54.5)	10 (45.5)	0.009, 1, 0.922
Connective tissue disorders [02, 03.1%]	01 (50)	01 (50)	0.024, 1, 0.876
Disseminated malignant disease [19, 29.2%]	15 (78.9)	04 (21.1)	6.032, 1, 0.014

Discussion

In our study, among all the risk factors, only obesity (p = 0.007) was found to be statistically associated with WD and chronic cough, diabetes mellitus, jaundice and malignancy were found to be statistically associated with SSI (p = 0.049, 0.001, 0.029, 0.014).

A comparative study of technique of retention suture by Chatterjee S, *et al* (2021) observed that wound dehiscence occurred in 3 (5.8%) patients in short stitch group whereas 8 (15%) patients in long stitch group developed wound dehiscence[11]. Another comparative study of intervention in patients with risk factors by Khorgami Z, *et al* (2013) found that 147 patients were followed in the intervention group and 148 patients in the control group. WD occurred in 6 patients (4%) in the intervention group and 20 control patients (13.3%) (P = 0.007)[8]. This is comparable to the occurrence of WD in our study and falls in the general range of rate of WD following laparotomy.

A comparative study on SSI due to Retention Sutures by Mandal, *et al* (2020) reported that 19.4% of the patients in the study group developed SSIs, compared with 13 (34.2%) in the control group. Three (8.3%) and two (5.6%) patients in the study group developed superficial wound dehiscence and deep wound infections (burst abdomen), respectively, compared to 8 (21.1%) and 4 (10.5%) in the control group, respectively[12]. The rate of SSI was much higher (44.6%) in our study after application of prophylactic retention suture. In a study by Ito, *et al* (2018)[6], diabetes mellitus, surgical wound classification, large incision and Retention Suture were associated with Surgical Site Infections (SSI) in multivariate analysis. In subgroup analysis, SSI risk factors were analysed in each surgical wound classification. Only in surgical wound classification class II and III did Retention Suture significantly reduce the risk of SSI [odds ratio = 0.100 (0.012-0.837), P = 0.034]. In class IV, however, half of the patients developed SSI, regardless of Retention Suture. The present data suggest that prophylactic retention suture reduces SSI for surgical wound classification class II or III. For class IV operations, however, other methods to prevent SSI are necessary.

Conclusions and Recommendation

The use of Retention Sutures is left to the discretion of the operating surgeon, but it is likely to be beneficial only for patients with a high risk of developing wound problems. It's important to educate patients about wound care and any concerns like Surgical Site Infection, pain, that may arise. Following abdominal surgery, many surgeons impose activity limits in order to prevent the failure of the fascial closure.

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 thick or Retention Sutures as a preventive strategy to eliminate or reduce the occurrence of wound dehiscence. Retention sutures have already been shown to reduce the rate of wound dehiscence after surgery and their use has also been suggested as a treatment choice for managing fascial dehiscence, however, due to the subsequent pain, postoperative discomfort and skin maceration, routine application of this technique has not been accepted. Considering the controversies involved in using this method for the prevention of abdominal wound dehiscence, my study included only patients at a high risk for developing Wound Dehiscence who would benefit the most from prophylactic retention sutures.

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