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A Multivariate Analysis of Risk Factors for Surgical Site Infection after Stoma Closure'

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1. Abstract

This is a retrospective analysis looking at data from a single center into what are the risk factors that can predispose to surgical site infection post stoma closure. The aim will be to identify the risk factors so that we could modify and intervene early based on the patient and surgical factors predisposing for SSI. However, this analysis, could not identify any cause risk factor for SSI. The incidence of SSI was 11.4%. The reason for this most probably attributable to low sample size in this study. The co-author has no objection for this paper publication.

2. Introduction

Intestinal stomas are a common procedure carried out in general and colorectal surgery. It has many indications and it can also be a lifesaving procedure to minimize complication from faecal contamination due an anastomotic leak. Diverting colostomy or ileostomy has increased as more complex colorectal surgeries and low colorectal anastomosis (i.e coloanal) are performed now.

The closure of stoma is done once there no more indication to keep the stoma or to divert the faecal flow through the anastomosis. The operation to close stoma is not without its own complications. Among the complications are surgical site infection (SSI) at previous stoma site, anastomotic leak and anastomotic stricture to name a few.

SSI is a common complication with a reported incidence ranging from 4% to as high as 43%. SSI following stoma closure will result patient to stay in ward longer, more out-patient follow-up, wound incisional hernia and wound related sepsis to name a few.

As stoma closure is a common surgical procedure in our center, we looked into the risk factors that can predict patients who will develop complications especially wound infection following closure of his stoma. This initiative is to better identify opportunities for quality improvement. This is the first time we are auditing our results, thus for a beginning we only looked into cases for 2 years (year 2018 and 2019).

3. Objective

Our goals to determine the incidence of SSI after stoma closure, to identify patient and procedural specific predictors for SSI after stoma closure. This will also give us opportunities to minimize the risk or prevent SSI by addressing the possible risk factor for SSI.

4. Methodology

This was a retrospective analysis where data were obtained from the local hospital database. We looked into all patient who underwent stoma closure (i.e ileostomy, double barrels stoma and colostomy) in the year 2018 and 2019. This was the first ever audit carried out in the department level to look into the incidence of SSI and factors implicated to SSI. There were only 34 patients who underwent stoma closure during the period.

Patient-specific variables including indication for stoma (i.e cancer surgery, trauma, infection), types of stoma (colostomy, ileostomy), stoma skin closure technique (continuous, interrupted), patient co-morbidities (Diabetes mellitus), BMI, duration of surgery of stoma closure, pre-operative albumin level and American Society of Anaesthesiologist category (ASA).

Patients were stratified into those with SSI and those with no SSI. Univariate analysis used to compare patient and procedure specific varible. As the sample size was small (N=34), a Fischer exact test and Wilcoxon Sum Test was used for categorical data.

Statistical significance was assigned for a p value < 0.1.

5. Results

All patients who underwent stoma closure for whatever the initial indication was incorporated into the study. There were 34 patients in total of which the indication for index stoma was due to malignancy (85%), perineal sepsis (5.9%), ischaemic bowel (5.9%) and complicated diverticulitis (2.9%).

Out of the 34 patients, 4 had surgical site infection (SSI) which resulted in our SSI rate was 11.8%. (n=4). Majority of them had ileostomy (n=20) while the remaining had colostomy. Majority of them had bowel anastomosed by hand sewn technique (90%) and only (10%) had stapler anastomosis.

Skin closure was done by subcuticular method in 6 patients (18%) while the rest were closed with interrupted manner. Patients with SSI and no SSI were similar in age, gender, type of stoma, and ASA class as the p value was > 0.05 (Table 1).

Table 1: Baseline characteristics comparing patients with no SSI to with SSI

Characteristic	**No,** N = 30[1]	**Yes,** N = 4[1]	**p-value**[2]
Age	64 (53, 70)	68 (61, 76)	0.3
Gender			>0.9
Female	12 (40%)	1 (25%)	
Male	18 (60%)	3 (75%)	
Race			0.7
Chinese	10 (33%)	2 (50%)	
Indian	1 (3.3%)	0 (0%)	
Malay	19 (63%)	2 (50%)	
Stoma Type			0.7
Colostomy	10 (33%)	2 (50%)	
End Stoma	2 (6.7%)	0 (0%)	
Ileostomy	18 (60%)	2 (50%)	
ASA Score			0.6
2	25 (83%)	3 (75%)	
3	3 (10%)	1 (25%)	
4	2 (6.7%)	0 (0%)	
Weight (kg)	70 (60, 76)	67 (55, 78)	0.7
BMI			0.6
<23	21 (700%)	2 (50%)	
>23	9 (30%)	2 (50%)	
BMI Category			0.6
Normal	20(67%)	2 (50%)	
Overweight	10 (33%)	2 (50%)	
Albumin(g/L)	37.0 (35.0, 39.0)	37.5 35.8, 39.2)	0.8
Unknown	2	0	
Operation Duration (min)	152(112, 241)	125(119, 154)	0.6
Operation Category			0.6
Long	13 (43%)	1(25%)	
Short	17 (57%)	3 (75%)	
Skin Closure			0.13
Continuous	4 (13%)	2 (50%)	
Interrupted	26 (87%)	2 (50%)	

[1]Median (IQR); n (%)

[2]Wilcoxon rank sum test; Fisher's exact test

6. Discussion

In this analysis, we could not find any association or risk factor causing SSI as none of the factors analyzed had statistical significance. As this was a pilot analysis, we feel the sample size were too small to come to a statistical conclusion. If we compare to other published paper, the sample size was large giving a better representation of the problem studied.

There were a few more important factors that were not included in the analysis due to inadequate data in the database namely pre-operative antibiotics use, smoking among patients, number of hospitals stay and use of subcutaneous drain post closure [3]. These are few of the important criteria that may affect the analysis. Thus, the outcome of this audit can be used to improve our documentation and data collection in future. In another study, four independent predictors for SSI were history of fascial dehiscence, thicker subcutaneous fat, and colostomy closure compared to ileostomy {2}. These factors can also be studied in future in our patient population.

The SSI rate was acceptable (11.4%) in comparison with published data, which ranges from 4% to 30% [2, 3]. However, the small sample size may also result in poor representation of the whole picture.

There are evidences that purse string skin closure technique has showed much reduce SSI rate in a very large sample study in Japan [3]. This can be a practice changing evidence as none of the skin closure technique in this center adopted this.

We will suggest to the local committee for a larger sample collection, for a period of at least 5 years in order to come to a better conclusion. Besides that, taking data from the year 2018 to 2019 may no be a true representation of the patient population as elective operative cases were all delayed or postponed due to the covid outbreak. This might have resulted in data not showing the true reflection of case burden.

7. Conclusion

The incidence of SSI was 11.4%. No factors showed any association or risk factor to develop SSI probably due to small sample size. Thus, further data analysis must be done using larger patient sample to reflect the true outcome and to get a statistically significant result.

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